THE REPERTORY OF PATENT INVENTIONS,

AND OTHER

Discoveries and Improvements

IN

ARTS, MANUFACTURES, AND AGRICULTURE;

BEING A CONTINUATION, ON AN ENLARGED PLAN, OF THE

Repertory of Arts and Manufactures:

A WORK ORIGINALLY UNDERTAKEN IN THE YEAR 1794, AND STILL CARRIED ON WITH A VIEW TO COLLECT, RECORD, AND BRING INTO PUBLIC NOTICE, THE USEFUL INVENTIONS OF ALL NATIONS.

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THE

REPERTORY

OF

PATENT INVENTIONS.

No. CIII. NEW SERIES.—JULY, 1842.

Specification of the Patent granted to JOHN EDWARDS, *of Shoreditch, in the County of Middlesex, Warehouseman, for Improvements in Giving Signals on Railways.*—Sealed December 11, 1842.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—My invention relates to the using of a series of lamps for night signals, and by the different combinations of the lamps when exposed or closed, various agreed-on signals may be communicated from a train of carriages to a station, or from a station to a train, or from one train to another.

And secondly, my invention relates to giving signals by day, by combining the use of a series of thin plates, and by the different changes which may be obtained by turning some edgwise, and presenting others to view, a similar mode of giving signals may be obtained; and in order that the invention may be most fully understood, I will proceed to explain more in detail the means which I pursue; at the same time I would remark, that many variations may be resorted to, in carrying out the invention. It will be evident, that the more lamps which are used in

one constellation, the more extensive may be the communication made; but as the extent of communication required from and to trains of carriages will not require to be very varied or extensive, I will suppose, that four lamps are used as the set or constellation, and each lamp so arranged as to be closed or open to view.

I may here remark, that I am aware that, at stations or railways, there are lamps used by which it is indicated to a coming train whether it is to stop or proceed beyond a lamp, and there are also surfaces used for like purposes for the day; but there is no means of making a communication to a coming or passing train, or between two trains. I do not therefore claim the use of lamps generally, nor the use generally of surfaces capable of being turned edgewise or surface wise; but my invention has for its object, the using of several lamps or surfaces, in such manner as to obtain varied communications thereby, according to the different combinations which may be made by closing and opening the various lamps in different orders and combinations in respect to each other, and the same observations apply to the use of thin surfaces for day signals, which are used by the edgewise view of any of them indicating the same character as the closed lamp, and the flat view indicating the open lamp. These matters will be better understood by the examples given by the annexed diagram when the same is explained.

I have not thought it necessary to shew the framing for carrying the lamps, as the same may be according to the positions of their placing, and the convenience offered by the carriage; and such may also be said in respect to those at the stations, taking care, however, that they are placed at such an elevation as to be seen as far off as possible.

I will, for example, suppose four lamps to be used, which I consider to be the most eligible number for ordinary purposes, and I have marked the lamps, A, B, C, and D.

Description of the Drawing.

When the lamp, C, is blinded, the lamps, A, B, D, form a triangle, of which A, is the pointing lamp, and signifies that the train is on the left-hand rails. When D, is blinded, A, B, C, form a triangle, of which B, is the pointing lamp, and signifies that the train is on the right-hand rails. Blinding and opening the pointing lamps, may signify "I see you," and the quickness or slowness with which that is done, will indicate the speed at which the train is proceeding; blinding the lamps, C, D, may signify, "stop, we want to speak to you;" opening all the four lamps, may signify, that a train has stopped; blinding the pointing lamp, may signify, "all is right;" blinding all the lamps, except the pointing lamp, may signify, whatever is thought best. The blinding and opening the lamps, is done by means of a frame made of iron or other suitable material, to which is attached the blinds, as will be seen by reference to the accompany drawings. E, F, blinds attached to the frame, V, V, for blinding the lamps, A, B. G, I, blinds for the lamp, C. H, K, blinds for the lamp, D. L, M, handles to the frame which works in slides in the trough, N, O, P, Q. S, T, cross-bars attached to the iron frame to hook the slides, G or H, to, when desired to blind either of the bottom lamps without blinding the lamp immediately over it. The above indications are only given as examples of what may be done, but the same will be arranged in order to suit the particular requirements of a railway. In obtaining telegraphic signals by daylight according to the same plan, but instead of lamps, thin sheets of metal or other material to be used of round or other shape, the face of the said piece of metal to be presented to the eye instead of the lamp not blinded, and the edge to represent the lamps blinded, as represented by fig. 2.

Having thus described the nature of my invention, and the manner in which the same is to be performed, I would

have it understood, that what I claim, is the mode of using a series of lamps or surfaces, and by obtaining and giving signals or communications in railways, by the varied combinations which may be had by the changing of the relation which the lamps or surfaces have with or respect to each other.—In witness whereof, &c.

JOHN EDWARDS.

Enrolled June 11, 1842.

Specification of the Patent granted to MOSES POOLE, *of Lincoln's Inn, in the County of Middlesex, Gentleman, for Improvements in Fire-Arms.*—Sealed October 14, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—The improvements relate to that description of fire-arms, to which are applied revolving breeches, which contain a series of small barrels according to the number of charges required, which small barrels are successively brought into a line with the main barrel of the gun; and the improvements consist in the means of arranging the different parts, by which I am enabled to cause, by the act of drawing the trigger, and afterwards withdrawing the pressure therefrom, to re-cock the gun, and the different small barrels of the breech to revolve, and the nipple be brought under the cock to be successively discharged, as will be more fully described; and the invention also consists in a mode of arranging the parts of the locks of guns, having revolving breeches applied thereto, so as to dispense with the cock or hammer, by bringing a moveable stop in such position that, as the breech revolves, the nipple of each small barrel, on which is placed the cap, will be brought in contact with it and explode, and thus discharge the gun, the action of which will be clearly seen

in the drawing. The advantage of such an arrangement will be that, when the breech is loaded, the gun may be discharged any number of times (depending upon the number of small barrels in the breech) without removing the gun from the shoulder, which, in sporting, will be a great benefit.

I will first describe the part of the drawing which relates to the mode of dispensing with the cock or hammer.

Description of the Drawing.

Fig. 1, is a side view of part of a gun shewing some of the parts; and,

Fig. 2, is an end view of the revolving breech, shewing the position of the nipples in relation to the barrel and the stop against which they strike. In these figures the same letters indicate the same parts. A, is the revolving breech barrel. B, the nipple. C, the moveable stop, which receives the blow of the nipple, it moves upon an axis, C^1. D, is a link connecting the collar, E, with the stop, C. E, is the collar attached to the barrel, G, but which does not prevent its turning. G, G, is the barrel or case containing a spiral spring. H, is a spring which brings back the mechanism to the position shewn in the drawing, when, by the action of the trigger, it has been pushed forward. I, is a wheel, having an equal number of teeth to the number of the small barrels of the revolving breech; this wheel prevents the barrel, G, from turning, being always connected with it. K, is a stop-piece which prevents the whole mechanism from turning. L, is a small spring which keeps the stop, K, in a proper position for preventing the wheel, I, from turning in that way which would unrol the spiral spring contained in the barrel, G, but which permits the wheel to turn in the contrary way, in order that the stop, K, should act to prevent the spiral spring from being drawn back. The manner in which the whole system acts, is as follows:—When the trigger is pulled, the barrel, G, is pushed forwards, and conse-

quently the collar, E, which, by means of the connecting-piece, D, turns the stop, C, and places it over the nipple, where it receives the shock, when the barrel turns round, which takes place when the wheel, I, has advanced sufficiently far to escape the stop, K, and the fire-arm will then be discharged; and by letting go the trigger the whole of the mechanism will be brought back to its position by the spring, H, which during the previous action was compressed, and the gun will be ready to be again discharged. It will be evident that the spring will not unrol more than one-fifth or one-sixth of a turn for each time the gun is fired; according to the number that it is made for, either five or six.

I will now describe an arrangement where a cock is used for striking against the nipple.

Figs. 3, and 4, shew views of part of a fire-arm. A, is the plate to which the lock is fixed. B, is the cock. C, is a lever connected to the cock, which lever has joined to it a cleat, D, which acts on a wheel and a tail-piece, F, upon which acts the spring, G. E, is the bearing of the lever. G, is a spring which raises the cock, after the gun has been discharged. H, is the barrel or case containing the spiral spring. I, is a wheel fixed to the barrel, H, which prevents its turning. K, is a stop, which prevents the wheel, I, from turning, and consequently the whole of the mechanism. L, is a small spring, for the same purpose as that described in fig. 1. M, is the spring for bringing back the mechanism to its primitive position after the gun is fired. N, is a stop, which limits the course of the lever, C, and consequently the rise of the cock. In pressing upon the trigger the barrel will advance, and carry with it the wheel, I, which as soon as it has passed the stop, K, will be free; it turns in drawing the cleat, D, of the lever, C, in front of which it is placed, and consequently lets the cock fall upon the nipple, which is so placed as to receive the blow, and so discharges the gun; the same movement of the spiral spring turns the breech and causes the cock to descend upon the nipple. The

spring will then force back the wheel, I, which takes into the stop, K, at the same time it releases the cleat, D, of the lever, C, which will then be free, and the spring, G, will bring it back into the position, shewn on the drawing, ready to be again discharged. In this arrangement the spiral spring only unrols one-fourth, one-fifth, or one-sixth, according to the number of times the fire-arm is to be discharged. To draw up the spiral spring of the barrel, it is only necessary to take the revolving breech, either with the hand or with a key, and to turn it in the proper way, the stop, K, not interfering with the movement of the wheel, I.

Figs. 5, 6, and 7, shew another arrangement, in which the same letters indicate the same parts in these figures. In this arrangement the spiral-spring causes the cock to descend, then turns the revolving breech, and then to raise the cock. A, shews the sides of the case which encloses the lock; and B, is the plate. C, is the cock. D, is the barrel, which contains the spiral spring. E, is a wheel, at all times fixed to the barrel, and which actuates the cock and causes it to descend. F, is a wheel to raise it again after the gun is discharged, and also to turn the revolving breech to which it communicates its motion: this wheel can turn, independently of the barrel, D; the spiral spring communicates its motion by means of a catch, shewn in drawing, fig. 14, upon which it is fixed at one of its ends. G, is the spring which brings back the machinery into the position shewn before the discharge takes place. H, is the trigger, one end of which has a small friction-wheel, which presses against the barrel containing the spiral spring; there is a small notch, I, in the trigger, into which the end of the sliding-piece, K, passes, in order to fix the trigger and prevent it being pulled, whilst the spring of the barrel, D, is being drawn or wound up. L, is a spring for the purpose of drawing back this sliding-piece, when it is required to pull the trigger. M, is a lever affixed to the axis of the cock, to which is at-

tached a tongue-piece, N, against which successively strikes the wheels, E and F, in order to lower and raise the cock. O, is a stop-piece, which prevents the cock from being raised too high, and prevents the wheels, N, from turning in the way which would raise the cock, but does not prevent its turning the other way; the distance required, and when in this position the trigger may be securely fixed by passing the sliding-piece, K, into the notch of it. P, is a spring to bring back the stop, O, into the position shewn in the drawing. Q, is a screw to regulate the position of the piece, O. R, is a bridle or cross-piece. S, is another stop to prevent the wheel, E, from turning, when the mechanism is in the position shewn in the drawing. In pressing upon the trigger, motion will be given to the spring-barrel, and thence to the wheels, E and F. The wheel, F, will let go the stop, N, and rest upon the stop, O; at the same time the wheel, E, will quit the stop, S, and lay hold of the stop, N, and thus acts upon the cock by letting go of the trigger, the spring, G, will force back the mechanism, and the wheel, E, will let go from the stop, N, and descend to the stop, S. To draw up again the spiral spring, the wheels, E and F, are pushed forward, by means of the trigger, so far, that the wheel, F, would let go of the stop, N, before the wheel, E, had let go the stop, S; the mechanism should then be retained in this position by sliding the piece, K, into the notch in the trigger; then the arrangement of the stop, O, allows the wheel to be turned in the way which draws up the spring, as in the preceding figures, by turning the revolving breech, either by hand or by a key.

Figs. 7, 8, 9, and 10, shew another arrangement, where, as in the before-described figures, the cock and the small barrels of the revolving breech are successively released, and the cock again raised; the same letters are used for similar parts. A, is the case which encloses the whole of the mechanism. B, is the revolving breech which may contain as many bores or barrels as may be required. C,

are the nipples on which the caps are placed. D, is the case or barrel containing the spiral spring. E, is the wheel which acts against the cock to lét it down ; and F, the wheel which releases it again. G, is a spring for the same object as the one previously described. H, is the plate of the lock. I, is the cock. K, is a lever to the cock. L, the counter lever, which is connected to it by means of a pin, and receives its movement from it, and which pin slides in the groove, N, which carries the counter lever, L, at the end O, is a hinge, in order that the wheel, F, may not be prevented from turning when it is desired to draw up the spiral spring. P, is a small spring to keep the piece, O, in a suitable position. Q, is a stop which prevents the wheel, F, from turning after it has quitted the stop of the counter lever. R, is a stop which prevents the wheel, E, from turning after it has quitted the lever, K. T, T, is the trigger which communicates motion to the case or barrel containing the spiral spring. U, is a hook which acts upon the trigger for the same object as the sliding-piece, K, described in the figs. 5 and 6. V, is a spring, one end of which is connected to the trigger, and the other to the lever, K, of the cock, which greatly assists in discharging the gun when pulling the trigger; the mode of action is similar to that described in the previous figures, and the spring is drawn up in the same manner as before-explained. *a*, is the barrel. *b*, is a band of iron placed over the whole length of the barrel, and which serves to connect the barrel to the box. *c*, is a screw which fixes the end of the band of iron to the box. *d*, is a shaft at the underside of the main barrel, which serves as the axis for the spiral case, the wheels, E, and F, and the revolving breech. *e*, is a screw which connects this shaft, D, to the main barrel.

Figs. 11 and 12, shew how the collar, X, (upon which is fixed the wheel, F,) communicates motion to the revolving breech : on this revolving breech is a small collar, Y, in the sides of which is a groove, into which works a

tenon, z, within the collar, x: by this arrangement the collar, x, and consequently the wheel, F, cannot turn without also turning the revolving breech. The arrangement in fig. 13, shews that the spiral spring only raises the cock and turns the breech, and a large spring placed over the spiral spring releases the cock and discharges the gun. A, is a lever in connection with the cock, having two claws; against one the large spring, B, acts and releases the cock, and against the other claw the wheel, C, acts to raise up the cock and draw back the large spring. D, is a stop against which the wheel, C, rests when it has quitted the lever, A; in order that this stop should not prevent the spiral spring from drawing back, it is fixed upon a small rod with a hinge, as shewn at the end, F, having a guide-piece, G. H, is the case containing the spiral spring. I, is a stop to prevent this case from turning. K, is a shaft or axis, to which is fixed one of the ends of the spiral spring, and which transmits the movement to the wheel, C. L, is a spring for the same object as described in the previous figures. M, is a small spring which keeps the rod, E, and the stop, D, in a proper position; the action of this arrangement is the same as that previously described. I would remark, that the arrangement which I have found best to answer in operation, is that described in figs. 7 and 8.

Having thus described the nature of the invention, and the manner of performing the same, I would have it understood that I lay no claim to the application of revolving breeches to fire-arms, they having been before used; nor do I confine myself to the precise details herein given, so long as the character of the invention be retained; and I would have it understood, that what I claim as the invention communicated to me is, first, the mode of constructing fire-arms with the revolving breeches, in such manner that the act of pulling the trigger will discharge the gun, and by withdrawing the pressure therefrom, the breech will revolve and bring up a fresh barrel to be dis-

charged, the other parts returning to their original position, as herein described at figs. 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13.

And, secondly, in the mode of constructing fire-arms with revolving breeches applied thereto, in such manner as to dispense with the cock or hammer by bringing each nipple, having a cap thereon, successively in contact with a moveable stop, which will explode the cap and so discharge the gun, as herein described at figs. 1, 2, and 3.—In witness whereof, &c.

MOSES POOLE.

Enrolled April 14, 1842.

Specification of the Patent granted to JOSEPH WRIGHT, *of Carisbrook, Isle of Wight, Mechanic, for Improvements in Apparatus for Dragging or Skidding Wheels of Wheeled Carriages.*—Sealed March 22, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention relates to a mode of applying apparatus to the skid-pans of wheeled carriages, whereby a skid-pan can be placed under a wheel, in order to skid or drag it, and when desired the skid-pan is removed, by allowing the wheel to pass over it, by releasing the drag-chain; and in order that my invention may be most fully described and readily carried into effect, I will proceed to describe the drawings hereunto annexed, in the various figures of which the same letters of reference are used to indicate similar parts.

Description of the Drawings.

Fig. 1, represents a side view of a stage coach, having my invention applied thereto.

Fig. 2, is a back view of the coach; and the various

other detail views shew the principal parts on a larger scale, by which their construction and manner of acting will be more readily traced. *a*, is the skid-pan. *b*, is a link by which the skid-pan is connected to the rod, *c*, by pin-joints at *e, e*, as is shewn. The rod, *c*, moves on a pin-joint or axis at *d*. To the hind axle is affixed the apparatus, *f*, to which the axis or pin-joint, *d*, is affixed. This apparatus, *f*, consists of the quadrant frame, *f*, which is affixed by means of the straps or lugs, f^1, to the hind axle of the coach, as is shewn in figs. 1 and 2. f^2, is a curved lever, which moves on an axis, f^3, carried by the quadrant, *f*. This lever is at all times pressed outwards at its hinder end, by a spring, f^4, as is shewn, by which means the fore end of the lever, f^2, has at all times a tendency to remain pressed against the upper part of the incline of the edge of the quadrant, *f*, by which means when the rod, *c*, is in front of the apparatus, *f*, and is allowed to drop, in order to lay the skid-pan in front of the hind wheel, the lever, f^2, will act as a guide to direct the rod, *c*, and prevent its descending in a perpendicular line, in the following manner:—c^1, is a projection from the side of the rod, *c*, and from such projection, c^1, descends another projection, c^2, as is clearly shewn in the drawing at fig. 3; and the nature of the apparatus, *f*, and parts connected therewith will readily be traced on examining figs. 4 and 5, as well as figs. 1 and 2. The drawing now under description shews the parts in the positions they would be, when the wheel is skidded or dragged, the red lines shewing the position of the parts immediately after the wheel has passed over the skid-pan, and the black dotted lines in fig. 1, shew the position of the parts when the skid-pan is raised out of use. *g*, is the drag-chain connected at one end with the lever, *c*; and at its other end there is a link, g^1, by which it is retained and held secure when dragging the wheel; but in unskidding the wheel, this link, g^1, is so arranged, together with the apparatus used therewith, that the chain, *g*, can

be released and allow of the wheel passing over the skid-pan, which mode of unskidding the wheel constitutes a peculiar character of arrangement in the apparatus constituting my invention. *h*, is a bar affixed to the fore carriage of the coach, and *i*, is a rod also affixed to the fore carriage of the coach, as is shewn; the rod, *i*, being used in order to assist in supporting the bar, *h*. At the fore part of the bar, *h*, and just where it is affixed to the fore-carriage, it is formed into a curved projection, h^1, on which the link, g^1, is received, and securely held when the wheel is dragged. *l*, is a forked lever, embracing the projection, h^1, and moving on an axis or pin, l^1, passing through the bar, *h*, as is clearly shewn at figs. 6 and 7; and it is by means of the lever, *l*, that the link, g^1, of the drag chain, *g*, is released, when it is desired to unskid the wheel, and this operation is performed by the simple act of raising the rod, *m*, which is attached to the lever, *l*, as is shewn, by which means the link, g^1, will be raised off the projection, h^1, by which the chain, *g*, will be released, and the skid-pan allowed to pass under the wheel. *n*, is a cord or chain attached to the link, g^1, by which the chain, *g*, is drawn back to the projection, h^1, after the wheel has passed over the skid-pan, such cord or chain passing over the pulley, *o*, and under the pulley, *p*, thence up to the barrel, *q*, where it is made fast; and when that barrel, *q*, is moved round, the cord or chain, *n*, will be wound up. *s*, is another cord or chain attached to the link, *g*, and rod, *c*, passing over the pulley, *t*, then under the pulleys, *v*, *v*; it is made fast to the barrel, q^1: hence when the barrel, q^1, is caused to turn, the chain or cord, *s*, will be wound up, and the skid-pan will be raised up into the position shewn by black dotted lines in fig. 1; but it should be remarked that when the skid-pan has passed under the wheel, the arm, *c*, will not be caused to stand out towards the wheel; but on being drawn up by the cord, *s*, the projection, c^8, will come on the inside of the lever, f^2; and the projection, c^1, will be raised above the plate, f^5, as is shewn by dotted lines in fig. 3, such plate, f^5, supporting

the end of the projection, c^1, as the rod, c, descends to skid the wheel, as is clearly shewn at fig. 3. And it will readily be understood, that in drawing up the rod, c, by the cord, s, that the projection, c^2, will pass from under the lever, f^2, at the fore end thereof, which it is allowed to do by the spring to that lever, such spring immediately closing the fore end of the lever, f^2, on to the incline of the quadrant, and thus again is in a position to guide off the rod, c, when it is again let down to skid the wheel. The barrels, q, q^1, are connected together and are moved by the handle, w, which is made capable of folding, in order to be out of the way, as is shewn at figs. 8, 9, 10, and 11, where the parts which work the cords are shewn separately. q^2, is a plate affixed to the barrels, q, q^1, and it has a special groove formed therein, as is shewn. x, is a lever, having a projection or stop, x^1, which, entering into the recess, y, in the plate, q^2, locks it from movement, till the lever is raised. The position of the parts in fig. 1, as above mentioned, is such as they would assume when the wheel is skidded; the position of the parts in figs. 8 and 9, is such as they would assume when the skid-pan is raised out of use; and in order to lower the skid-pan, the lever, x, is to be raised, when the cords would be free and the skid-pan would descend: all which will readily be understood on examining the drawings aided by the description above given.

Fig. 12, shews the side view, and

Fig. 13, is a back view of another carriage, having my invention applied thereto; and the parts are shewn to be in the position they would assume immediately after having released the skid-pan, and the wheel having passed over it. In these figures, as well as in the detail figures on a larger scale, the parts are all marked, with the same letters of reference as those above given, and the description thereof will apply to the present figures, there being only very slight variations in some of the details, which will be evident to a mechanic on comparing the drawings.

Having thus described the nature of my invention, and the manner of performing the same, I would remark that although I have been particular in shewing and describing all the details of mechanical apparatus employed by me in carrying out my invention, yet I do not confine myself thereto, as the same may be varied, without departing from my invention, provided the peculiar character of the invention be retained; but what I claim is the mode of applying skidding or dragging apparatus to wheels of wheeled carriages, whereby in unskidding the same the skid-pans are allowed to pass under the wheels, by releasing the drag-chain as herein described.—In witness whereof, &c.

JOSEPH WRIGHT.

Enrolled September 22, 1841.

Specification of the Patent granted to EDWARD JOSEPH FRANCOIS DUCLOS, *of Clyn Wood Metallurgical Works, near Swansea, in the County of Glamorgan, Engineer, for Improvements in the Manufacture of Copper.*—Sealed November 11, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—My improvements consist in calcining all sulphurous ores of copper, technically called sulpherets, or other artificial products of the same nature, in large kilns, as may be seen by drawing (1) hereunto annexed, whereby a large proportion of the coal and labour required in the ordinary treatment are economized, and the sulphurous acid gas and sulphuric acid formed in the operation, irretrievably lost in the ordinary method, are made applicable to the manufacture of sulphur or sulphuric acid.

Secondly, when the ores have been sufficiently calcined, to treat them for the reduction of metallic oxides that they

may contain, in a blast furnace similar to those used in the manufacture of iron, with addition of chambers of condensation and feeding apparatus, as may be seen by drawings (2) hereunto annexed, such add tions being calculated to insure the collecting of any volatile produce that the ores treated may contain; the earthy matters associated with the ores are fluxed by a proper addition of lime or other substances, as the chemical composition of the ores to be treated may require.

Thirdly, the mixture of metallic copper with cast iron obtained in the preceding operation, is then submitted to fusion and liquidation in a common ironfounder's cupola modified to insure the liquidation of the two metals, as may be seen in the drawings (No. 3) hereunto annexed.

Fourthly, the black copper from which the cast iron has been separated by difference of gravity, is then submitted to the refining process, as in the usual method, in the refinery attached to the furnace of liquidation.

Description of the Treatment.

The ores of copper, when ground to the size of one-fourth or one-third of an inch, are mixed in the following proportions with quick lime, that is to say:—

Two and a half cwts. of quick lime, or thereabouts, for every ton of copper ore. The quick lime is slacked thin and mixed with the ore in the same manner and consistence as common mortar; it is then laid on heated floors, between two and two and a half inches thick, and cut as soon as spread, in parallelograms of the same size that common bricks are generally made: the floors are then kept hot for twenty-four hours, when it will be found that the mixture has acquired sufficient solidity to remove the rough bricks so produced to the kiln where the calcination is to be effected. The doors through which the bricks have been piled being closed and luted, a fire is kindled on the grate of the kiln furnace, until the mass becomes of a dark red heat. The ash-pit door, to which air slides

are fixed, is closed hermetically, as well as the fire door; and the admission of the fresh air is thus controlled, to keep the mass of ore burning to the same temperature, which is also better effected by the regulation of the draft of the escaping products of the combustion, by means of dampers placed on the eduction-flues. It is found in practice, when the first combustion is over, that it is advantageous to light another fire at a rather increased temperature, and thus more completely obtain the expulsion of the sulphur contained in the ore, by the repetition of the above described treatment. The ores of copper in lumps, not exceeding 2 inches square, may be calcined in prismatic kilns with double grates, with the same arrangement of the kiln described, necessary for the regulation of the draft; and, when sufficiently calcined, may be taken at once to the blast-furnace. The ore thus calcined is charged with a sufficient quantity of coal, or coke, or charcoal, in such proportion as the calorific power of the fuel and refractibility of the ores will best allow, and which is best ascertained by practice; and also a proper quantity of lime or other flux is to be used as the chemical composition of the ore will require. The charge is put into the furnace in such a manner as to avoid the escape of any volatile product other than through the chamber of condensation. The working of the furnace is the same as that followed in the working of iron ore, taking care to work with a blast highly heated and with closed breast, endeavouring to obtain a slag highly charged with lime, by which means the reduction of the metallic oxides is more perfectly insured, and their carburation, as far as iron is concerned, more certainly obtained.

The mixture of cast-iron and copper thus obtained, is tapped out, as common cast-iron, in the most advantageous shape for the re-fusion; and the operation is thus conducted with great economy of labour and combustible matter, without any interruption.

The pigs of mixed metals thus obtained are melted in

a cupola (figure 3), and the melted metals are, by a disposition which keep them at a high state of temperature, allowed to separate by difference of gravity, the copper precipating under the cast-iron, both of which are tapped at various levels, the cast-iron thus containing half or a quarter per cent of copper, and the copper from twenty to twenty-five per cent. of iron, which mixture is allowed to run out of the cupola in an air furnace, where it is kept at a high temparature, further to allow the more complete separation of the metallic copper from the cast iron, and the proportion of that metal left mixed with the copper is further separated by means of the usual mode followed in the refining of black copper in the furnace where it has been tapped out of the cupola.

I claim the mode of calcining the ores and fusing them in a blast furnace, as herein described; and also I claim the mode of separating the metals obtained in the treatment of the blast furnace, as above described.—In witness whereof, &c.

EDWARD JOSEPH FRANCOIS DUCLOS.

Enrolled May 11, 1842.

Specification of the Patent granted to HENRY McEVOY, *of Graham Street, in the Parish of Birmingham, in the County of Warwick, Hook and Eye Maker, for Improvements in Fastenings for Bands, Straps, and parts of Wearing Apparel.*—Sealed April 5, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—My invention consists, First, in a fastening applicable to bands, straps, and parts of wearing apparel. This fastening may be used with considerable advantage, in many instances, in place of buckles, as applied to bands and straps belonging to horse-harness, carriage-furniture, gentlemen's stocks, &c.: it is likewise well adapted for clogs;

but I have found it to be particularly useful as a means of attaching straps to trowsers, and in that application thus describe it.

Description of the Drawing.

Fig. 1, represents a plate, which may be made of brass, steel, or any other suitable material; but I prefer brass. The tongue, A, forms a spring, made sufficiently elastic to cause it to return to its flat or central position after having been forced either way by the introduction and withdrawal of the staple, B, fig. 5. This spring may be made of other metal than that of which the plate is made, and attached thereto by means of rivetting, or any other suitable way; the plate and tongue may likewise be made in any other suitable form.

Fig. 2, represents what I call a shield, as it is intended to sustain the pressure occasioned by forcing the staple, B, fig. 5, into the position it is intended to occupy when fastened, and likewise to secure free space for the action of the spring. It further prevents the top of the staple from acting objectionably against the boot, shoe, or any adjacent surface. The middle part is raised or domed, and the extreme edge bent so as to form an inlet for the reception of the plate, fig. 1. The strap is prepared by cutting a square part out at the end, as at *c*, fig. 3, and piercing three rivet holes corresponding with those represented in fig. 1 and fig. 2; the plate and shield are then attached to the prepared strap by means of rivets, and the strap assumes the appearance represented in fig. 4.

Fig. 5, represents the part which I call a top, to be attached to the trowsers by means of sewing or any other suitable means. Other forms than that described may be used; and it may be made of various kinds of metal; I make use of German silver, brass, and iron. The staple may be cast with the top, or attached thereto by means of soldering or rivetting. The staple is made to partake slightly of a hook form, as represented in fig. 6.

In fastening the strap thus prepared, I bring the staple belonging to the top into a position immediately over the end of the spring and by gently forcing, the spring gives way, and after allowing the staple to pass, returns to its original position. The end of the spring having entered the square hole of the staple, prevents the staple withdrawing, and gives security to the fastening. The staple thus forms a hook acting against that part of the plate, fig. 4, marked D, and is capable of sustaining great force or weight.

In unfastening the strap, the top or part to which the staple belongs becomes a lever, and, pressing down the end at E, fig. 7, the strap, at F, acts as a fulcrum; the staple by this motion is brought to act against the spring, and the spring giving way in an outward direction, the two parts become detached. This fastening will be found much superior in point of dispatch and security to any other hitherto used.—In witness whereof, &c.

HENRY McEVOY.

Enrolled October 5, 1841.

Specification of the Patent granted to FRANCIS WORRELL STEVENS, *of Chigwell, in the County of Essex, Schoolmaster, for certain Improvements in Apparatus for Propelling Boats and other Vessels on Water.*—Sealed November 19, 1839.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention appertains to certain improvements in the construction and arrangement of paddle-wheels for steam-vessels, and its objects are to attain the means of apportioning, adjusting, or regulating the propelling surface of the floats or boards to the power of the engine and speed

of the vessel, and also to gain the most effectual shape or figure of propelling surface of such floats, boards, or propelling surfaces. And my improvements chiefly apply to the floats or boards of propelling surfaces, which I place at an angle of about 55 degrees to the axis of the wheel, and when in a vertical position make an angle of about thirty-five degrees with the keel of the vessel. And as I am aware that many different arrangements and constructions of paddle-wheels furnished with oblique paddles or shafts have heretofore been used, I shall proceed to describe my improvements, and point out what I consider the novelty of my invention, referring to the drawings hereunto annexed, the better to illustrate the same.

The first object of my improvements I attain by placing the several floats, boards, or propelling surfaces upon round radial arms, which will allow of the several paddles or floats being shifted into different angles or positions to the axis of the wheel, so as to accommodate or adjust the propelling surface offered to the resistance of the water to the power of the engine, or the best effect produced thereby in propelling the vessel through the water; and when so adjusted, I fix or secure the several floats or propelling surfaces, first, by fastening the connexions of the floats, boards, or propelling surfaces to the arms, and then connecting the edges of the several paddles or floats, one to the other, firmly, by means of rings or rods, placed either diagonally or longitudinally, or both, so as to convert them into one secure and complete paddle-wheel; and the second object is attained by a peculiar shape or figure of the float-board or propelling surface, all of which will be better understood by the following description thereof. My invention consists in the arrangement and construction of what are commonly called the floats or paddles, or propelling surfaces, which may be made or formed of iron, copper, wood, or other suitable material. The floats or paddles are placed obliquely in the framework of the wheel, and enter the water edgeways, and

extend from the circumference to about a third or more of the radius, and resembles the fans or sails of a windmill or a smoke-jack, and the floats or boards are secured to the shaft, by being placed upon radial arms; and my improved wheels take much greater dip in the water than the common paddle-wheel, being immersed about one half their radius, or a little more. The floats are wide, near the circumference, and narrow towards the centre, or of the form of the segment of a sector, although they may be made of any other form or figure, and have either a flat or a curvileneal form given them. They are shaped as segments of two concentric circles, the inner one of which being at about one third of the distance of the radius of the greater circle. The diameter of the wheel will depend upon the power of the engine and the height of the shaft from the water, which in new vessels or engines would be advantageous to bring much lower, as my improved wheel takes a greater dip in the water. The angle at which these floats or paddles are placed will also depend upon the size of the wheel and power of the engine, and will generally be about twenty-five degrees to thirty-five degrees: they are so contrived that the angle may be lessened or increased, to suit the power of the engine, and then firmly fixed, so as to possess unyielding strength and solidity. The floats, fans, or paddles, being thus arranged and secured, enter the water with little or no resistance, like vertical oars striking the water at a point obliquely, and on arriving in a vertical position make an acute angle of about thirty-five degrees with the keel of the vessel, and their inner edges at the same time pointing to the stern, and on emerging therefrom cast the tail water at a corresponding angle, or away from the side of the vessel, so that she makes her way in still water, and thus avoids being retarded by the rapidity of the water, which is usually thrown against her sides by the common paddles. By the floats or paddles entering edgeways or like an oar, that tremulous motion, usually experienced in steam-vessels

fitted with ordinary paddle-wheels, is avoided; and my improved paddle-wheels will continue to work smoothly, even when suddenly plunged up to the boss by a heavy sea; all of which will be better understood by reference to the accompanying drawings, which I will now proceed to describe.

Description of the Drawings.

Let fig. 1, G, H, F, represent the outer circle; I, K, L, a smaller, or the inner end of the propelling surfaces, or floats, which circles are concentric to each other; and the space included between them (*i. e.*, the depth of the floats) may be divided into any number, equal parts, according to the diameter of the wheel, and the intended width of the wheel; I have taken sixteen: thus, D, E, B, C, will be a segment, or portion of the sectre, A, D, E, and D, E, B, C, will be the part of a ring or sector which will form one of the float-paddles or propelling-surfaces.

Let fig. 2, D, E, B, C, represent one of the said floats, fans, or paddles, detached, and which, I propose, to make of sheet iron or copper, or wood, of sufficient strength, for the purpose intended, which float or propeller is supported on the arm, *a*, *b*, by means of clamps, *c*, *d*, which are securely held by screw bolts and nuts. F, represents one of such clamps, *c*, *d*, which, when the screw-bolts are loosened, admit of the adjustment of the float to any angle or any position, along the arm, *a*, *b*.

Fig. 3, represents the manner in which the radial arms are supported when placed in the boss, L, on the shaft, I, K. A, B, are two of such arms, supported by the iron-rods, C, D, and E, F, each of which is secured to the shaft by iron-rings, or a small boss, firmly keyed on the shaft. L, is a strong boss, having brackets or flanges on either side to give it strength.

Fig. 4, is a side view or elevation of one of my improved paddle-wheels, separate or detached from the vessel, having only eight floats.

Fig. 5, is a smaller representation of the other or reverse side to fig. 4.

Fig. 6, is an edge view; and,

Fig. 7, a section taken vertically through the same. In all these figures, the outer rings or rods, which connect the several paddles or propellers together, are removed, in order the better to shew the various parts, and the floats or propelling surfaces are shewn of a greater depth than one-third the radius of the wheel.

Fig. 8, shews the complete wheel, when the floats or propelling surfaces have been adjusted to the required position, and secured by rods or rings passing from one to the other, and represents the left or larboard paddle-wheel; and the floats, on arriving in a vertical position, form an acute angle with the keel pointing to the stern of the vessel; and *a, b,* is the water-line or depth of immersion of the wheel, which in this instance is about half the radius. A, is the shaft or axle of the wheel. B, the boss or nave securely fastened to the shaft in any convenient manner. C, C, C, are radial arms fastened on to the boss by screws or otherwise. The outer extremeties of these arms are connected together by means of the ring, D, D. The paddles or floats are secured in their proper position by rods passing from the corners of one paddle to another: or the same may be done by means of rings connected to the corners of all the paddles. E, E, E, are the several floats or propelling-surfaces fastened on to the several radial arms by screw-clamps or other fastenings at E, F: and by loosening these screws or fastenings, the various floats or surfaces can be shifted to any required position along the arms, and to any angle to the axis best suited to the engine and speed of the vessel. G, G, are other radial stays or braces passing from the ring, D, to the boss on the shaft, for the better securing the ring, D, to the axis and strengthening the wheels. The wheel is fixed on the ordinary shaft, which shaft is at right angles with the wheel and the vessel. The object

of these improvements is to avoid the usual lift of back-water and that blow which an horizontal rectangular float strikes the water, and to attain that smoothness in the action of the engine, whatever the sudden immersion of the wheel may be, and to avoid tremour; to increase the speed of the vessel, to enable a vessel to take a heavy burthen without affecting the working of the engine or diminishing the speed of the vessel; and, by the general combination of such arrangement, to effect a reduction in the width of paddle-wheels, and, consequently, of the paddle-boxes.

Having described my improvements, and the manner of carrying the same into effect, I would, in conclusion, remark, that from the foregoing description, and the accompanying drawings, it will be readily understood, that by this arrangement the wheel is enabled to take a greater dip, or work in a denser medium, than the common paddle; and the speed of the wheel, and, consequently, the engine may be regulated by an alteration of the angle of the floats, and thus alter the actual propelling surface offered to the resistance of the water.

In conclusion I would remark, that I claim the general arrangement and construction of the wheel, and of the floats or propellers, their form, the mode of adjustment, and the dip of the wheel, before described.—In witness whereof, &c.

FRANCIS WORRELL STEVENS.

Enrolled May 19, 1840.

Specification of the Patent granted to WILLIAM BROCKEDON, *of Queen Square, in the County of Middlesex, Esquire, for Improvements in the means of Retaining Fluids in Bottles.*—Sealed January 31, 1840.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention consists of a mode of constructing and applying discs or capsules, which are fastened on the top of the stoppers which enter or cover the mouths of the bottle, serves, when tied or wired on, to keep the stoppers firmly in their place and retain them against the pressure from within the bottles.

In order to fasten the disc upon the cork or stopper, I form, by means of a die, grooves across the disc or capsule, in which the wire will lie extended, and thus present wider and more secure points of bearing over the top of the bottle or vessel. In order to secure an equal pressure and contact of the flat stopper, composed according to my former patent of woven or felted wool or other fibrous elastic material faced with Indian-rubber, I adopt, among other forms one very well fitted for my purpose; instead of sinking a groove in the upper face of the disc or capsule, I raise bosses or ridges, which serve as guides to the wires or ties, to keep them apart and distribute their force of resistance, and securely hold the wire or string from slipping off the top of the disc, in fixing the disc to the mouth of the bottle. In making such discs or capsules, I usually form them of iron or other metal turned; but do not confine myself thereto: circular blanks being cut out of the sheet of iron, or other metal, is then placed in a die of the desired form and size, and, by means of a fly-press or stamping-press, the required form is obtained.

Description of the Drawing.

Fig. 1, represents a plan and edge view of a disc or capsule; and,

Fig. 2, shews their application, by a section and outside view, of the neck of a bottle, the disc or capsule having a groove sunk in it for wire or string for fastening over the cork or stopper which enters into the neck of a bottle.

Fig. 2, shews the invention applied to stoppers which are made according to my former patent.

Fig. 3, shews an underside view.

Fig. 4, a plan or upper surface view of a disc or capsule of a somewhat different form to that at fig. 1; and in place of the wire or string being held in a groove, it is held between projecting surfaces sunk in the disc, as shewn at *a*, *a*.

Figs. 5 and 6, shew such capsule or disc applied to the neck of a bottle having a flat stopper made according to my former patent.

Fig. 7, shews an edge view and plan of a similar disc or capsule and ordinary cork.

Figs. 7 and 8, shew the application of such disc or capsule, with an ordinary cork, to the neck of a bottle.

I would remark, that I do not confine myself to the precise form of the discs or capsules, nor to the material; and the capsules or discs may be made by other means than what I have described, without departing from my invention; and although I have shewn particular modes of stopping bottles by my patent stoppers, and by ordinary corks, they form no part of my present patent, excepting so far as the using of discs or capsules; but what I claim is, the mode of employing capsules or discs, as above described.—In witness whereof, &c.

William Brockedon.

Enrolled July 31, 1841.

Specification of the Patent granted to JOHN GARNETT, *Merchant, and* JOSEPH WILLIAMS, *Manufacturing Chemist, both of Liverpool, in the County of Lancaster, for an Improved Method of Manufacturing Salt from Brine.*—Sealed November 9, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—The nature of our improvements in making salt from brine, is as follows, that is to say:—Instead of applying heat to the bottom or sides of the pan containing the brine to be evaporated, we use pipes or tubes of metal, passing nearly horizontally through the fluid, and through these pipes we pass steam from any suitable steam-boiler or generator, for the purpose of conveying heat to the brine. This arrangement admits of the cistern or pan containing the brine, being made of slabs of stone, slate, earthenware, wood, metal, or any other similar substances, preferring those that are bad conductors of heat, and on which the salt may be deposited without injury.

Description of the Drawing.

The drawing shews a pan for evaporating brine. *a, a,* being a steam-pipe through which steam is passed, in order to heat the brine in the pan. The arrangement above given, is for making the coarser grain salt; if the fine grain salt be required to be made, then a larger extent of heating surface of the pipes will be used, in order to raise the temperature of the brine, and keep it at a boiling temperature.

We would remark, that the shape of the pan may be varied, and also the size and direction of the steam-pipe employed.

And we wish it to be understood, that we are aware, that triangular flues or chambers have been proposed to be used, and to have steam passed through them when

contained in salt pans, but we believe without success; we therefore do not claim the use of chambers or vessels with three flat surfaces.

But what we claim, is the mode of heating brine in the manufacture of salt, by applying cylindrical or curved surfaced pipes or tubes for conveying steam through brine.—In witness whereof, &c.

JOHN GARNETT.
JOSEPH WILLIAMS.

Enrolled May 9, 1842.

Specification of the Patent granted to WILLIAM HENRY MORTIMER, *of Frith Street, Soho, in the County of Middlesex, Gentleman, for Improvements in Covering Ways and Surfaces, and in Constructing Arches.*—Sealed November 16, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention relates to a mode of combining certain substances in the blocks used in covering paving ways and surfaces, and in constructing arches, whereby each block having its two opposite sides reversed in their cut, will go together in producing a covering arch, and give to each other support; and in order that my invention may be fully understood, and readily carried into effect, I will describe the drawing hereunto annexed.

Description of the Drawing.

Fig. 1, represents a block constructed according to my invention, in which it will be seen, that the side towards the left-hand is cut with an angular or inclined surface, from *a* to *b*, and then there is a projecting tongue produced at *c*, which enters a corresponding groove formed in the reverse side of the next block, then there is a

second inclined surface from *d* to *e*; and it will be seen that the opposite side of the block a^1, b^1, is the reverse inclined surface to that at the upper part of the other side of the block, and that there is a groove, at c^1, to receive a tongue, *c*, of the next block, and then there is another inclined surface from d^1, to e^1, the reverse of that at *d*, *e*, on the other side.

I would remark, that I do not confine myself to the making the inclined surfaces to the precise angles shewn, as they may be varied, and the tongue and groove may be varied in shape and position; the object being to combine two inclined surfaces with a tongue or groove, so that in addition to the blocks being combined by the tongues and grooves, and rest on each other above and below the tongue and groove.

Fig. 2, shews a road way covered with such blocks.

Fig. 3, shews an arch formed of such blocks.

And I would remark, that the blocks may be made of wood or other materials, according to the purpose to which the blocks are to be applied.

Having thus described the nature of my invention, and the manner in which the same is to be performed, I would have it understood, that what I claim, is the mode of constructing blocks for covering roads and ways, by combining the inclined surfaces, *a*, *b*, and *d*, *e*, with a tongue, and forming, on the opposite side of the blocks, inclined surfaces and grooves as above described.—In witness whereof, &c.

WILLIAM HENRY MORTIMER.

Enrolled May 14, 1842.

Specification of the Patent granted to WILLIAM BROCKEDON, *of Queen Square, in the County of Middlesex, Esquire, for a Combination of known Materials, forming a Substitution for Corks and Bungs.*—Sealed October 17, 1838.

To all to whom these presents shall come, &c., &c.—My invention relates to combining fibrous materials with Indian-rubber (caoutchouc), in such manner as to form stoppers to be used as substitutes for corks and bungs; and in order to give the best information in my power, I will proceed to describe the means and process pursued by me, and which I have found fully to answer.

And I would remark, that the fibrous materials I prefer, are those which are capable of felting, but I do not confine myself thereto.

I prepare the stopper of wool, which being bored out in the usual way for felting, and as is well understood, it is then felted in a roll of the diameter and length required, and to the degree of hardness, which will leave the stoppers sufficiently soft and elastic. The roll may be made of any length convenient for the felter to work it, and it may be made by hand as hatters felt their work, or otherwise, as is well understood. When the roll of fibrous materials is thus prepared, the next operation is to rub it over with Indian-rubber (caoutchouc) in solution, as is usually sold dissolved. The solution should be of sufficient consistency to lie as much on the surface of the stopper as possible, yet fluid enough to work freely, or the stopper may be immersed in the solution; but in this way, a larger quantity is absorbed, than is really necessary to coat the surface. When this coat of Indian-rubber has hardened by the evaporation of the solvent, I take a piece of very thin sheet Indian-rubber cut from blocks, or otherwise obtained,

which being slightly rubbed over on one side with solution of Indian-rubber, such side is applied to the stopper, which has been previously prepared, as above explained, and is brought round it, and the edges joined; it is then rolled to make the contact of surfaces complete. If the film or sheet of Indian-rubber be very thin, it may overlap, when the solution will produce perfect contact. Or in place of cutting the roll of fibrous materials into the lengths of single stoppers or corks, before covering the same with Indian-rubber, I can coat or cover a considerable length of such material with Indian-rubber, and subsequently cut the roll into lengths of stoppers desired; and the roll may be either cylindrical or conical according to the stoppers desired; and I have found that a convenient mode of covering such rolls, is to spread the solution of Indian-rubber evenly on a sheet of glass or other suitable substance, (which will not strongly adhere when the solvent has evaporated,) such as marble, and by a sharp knife, I divide the sheet of Indian-rubber into the sizes required, but do not remove the sheets from the glass or other surface, but bring the prepared roll of fibrous material coated with solution as explained, and roll it on to the sheet, of the size to cover it, which I prefer slightly to overlap where the two edges meet together; the sheet by this means, will adhere to the roll, and part with the glass. A stopper thus far prepared, is then put aside, until it has hardened enough to cut away the Indian-rubber at the ends with scissors or any convenient cutting instrument; other portions of sheet Indian-rubber of a convenient size, are to be applied in like manner to the ends of the stopper, the ends of the stopper being first prepared by a thin coating of the solution of Indian-rubber, and by pressure, such end pieces to come into perfect contact with the ends of the Indian-rubber covering previously rolled around the stopper. When the end pieces last put on, are firmly

set or hard enough, those portions which project are to be removed, by cutting true to the sides, and the stopper will be completed. In applying these plugs to the bottles, it is desirable to place within the neck of the bottle a small wire, with a longitudinal groove in it, to allow the air to escape, otherwise these stoppers are so elastic, and fit so air-tight, that it is otherwise difficult to insert them. When the stopper is in its place, the wire is withdrawn, and the stopper is in some measure kept in its place by the pressure of the atmosphere.

Though the above is the mode of carrying out my invention, I do not confine myself thereto, as it must be obvious that other means and other fibrous material or mixture thereof, may be used for making suitably elastic fibrous stoppers, and other means may be employed for coating the same with Indian-rubber (caoutchouc); the object of the invention on the one hand, being to obtain elastic stoppers by the employment of fibrous materials in any form suitable for the purpose, however brought about; and on the other hand, to make such stoppers imperviable to liquors and to air, by the use of Indian-rubber (caoutchouc), however, that may be accomplished. It will therefore be seen, that the invention does not consist of fibrous materials alone, nor of Indian-rubber (caoutchouc) alone, but such a combination of these materials, as will produce the object desired.

And it should be remarked, that there will be considerable advantage in the use of such stoppers over the employment of corks, as the stoppers made according to my invention, may be used over and over again, although they may have been drawn by a cork-screw, for it will be evident, that the punctured parts may be repaired by a fresh covering of Indian-rubber, when the stoppers will be again as good as before.—In witness whereof, &c.

WILLIAM BROCKEDON.

Enrolled April 17, 1839.

Specification of the Patent granted to CLAUDE SCROTH, *of Leicester Square, in the County of Middlesex, Gentleman, for certain Improvements in the Process, Manner, or Method, of Embossing or Producing Raised Figures, Designs, or Patterns, on Leather, or such like Materials, and in the Manner or Means used for effecting the same; also in the Making or Forming certain Tools or Apparatus used therein.* —Sealed June 26, 1839.

To all to whom these presents shall come, &c. &c.—The object of this invention is to make or produce, in an economical and perfect manner, fac simile copies of designs, figures, or patterns, done in basso-relievo, or in raised figures, whether stamped, carved, embossed, sculptured, modelled, cast, or otherwise produced; such copies or fac similes being by my improved process obtained in leather or skin of animals, or in connexion with other materials when required. These copies of devices are applicable to all the purposes, where such basso relievo ornamental work is required for the decoration of the interiors or exteriors of buildings, (as medallions, cornices, pannels, rosettes, picture, or other frames, &c. &c.,) and also for cabinet work, and various other articles of furniture, and in all situations where such raised or embossed ornamental work is applicable; and my invention consists, First, in the improved process or method used, in producing such fac-simile copies in basso-relievo or raised ornamental articles, and in the second place, in improvements in making or forming the matrixes and dies, or apparatus used in the process of obtaining the same.

Having thus stated, in general terms, the nature and objects of my invention, I will proceed to describe the manner of carrying the same into effect. I will, first, describe the improvements in the making or forming of the dies, pots, or apparatus, in order to facilitate the des-

cription of my invention, and then the manner in which they are used, in the process of forming or obtaining said basso-relievo, or embossed ornamental articles. The metal plates, dies, or blocks, to be used in producing the copies or fac-similes of the different basso-relievos, are made by casting them from plaster or clay models, previously prepared for this purpose, either by taking impressions or moulds from old carvings, embossings, pieces of sculpture, or castings of the designs or pattern of the same, is suitable for this purpose, or by modelling or forming new patterns, designs, or figures in clay or plaster materials, after the manner sculptors model their designs, previous to operating upon marble. The metal plates, blocks, or dies, are to be formed of any suitable material or mixtures of metal, but I prefer the following alloys, first, lead and antimony, in about the same proportions as used for topography; second, fusible alloy of bismuth, lead, and tin (as that commonly known as Darcit's alloy). The proportions are varied according to the use intended to be made of the dies. The alloy of lead and antimony I use for blocks, plates, or dies, in which the skins are to be embossed without using the press, as hereafter explained. The alloy of bismuth, tin, and lead, I use for dies, submitted to the action of the press. The dies into which the leather or skin is forced by hand, require to be only about the thickness of three-eighths of an inch, this thickness being regulated by the process of making them. Having obtained the plaster, clay, or other model or design, a thin sheet of tin-pewter, tin-foil, or lead, is first to be laid over it, and caused to take the form of the design (that is to say) made to enter into all the countersunk parts and interstices. Upon this sheet of tin-foil is placed a layer of earthy materials, of the thickness the intended die or block is to have when cast; over this earthy covering is to be poured plaster of paris mixed with water. This plaster, when set, will form a recipient, into which the metal alloy is afterwards to be

poured, the object of this recipient being to economize the alloy. When the plaster becomes set, the cap or tin-foil is to be raised and the earthy matters removed, the model being preserved during the operation by the tin-foil, which was placed between it and the earth. It will be understood that on the model being placed in the hollow plaster recipient, the projecting parts of the model will correspond with the countersunk parts of the recipient, and between these two parts (that is to say) the model and recipient, there will be a space equal to the thickness of the earth used in the first operation. The recipient is now to be placed on the lower plate or bed of a screw-press and properly adjusted, and the requisite quantity of of the alloy poured into it. The fluid alloy having been poured into the recipient, and arrived at a proper consistency (the workmen continually stirring it to prevent the heavy metal separating from the light), the plaster-model is then carefully placed upon it, and the follower of the press being brought down quickly, will force the plaster model into the metal alloy, and produce the required matrix or mould. When it is necessary to use great care and nicety in obtaining the metal mould, the plaster model should be accurately adjusted and affixed to the upper plate of the press, and brought with it quickly down on the metal alloy.

In order to prevent the plaster-model from breaking, by being too suddenly brought into contact with the hot metal, it will be found necessary to place it in a stove or drying place, in order to drive off any moisture it might contain, after which it should be allowed to cool in a dry place. If it is desirable to use the same mould several times, it should be made of lead or any other suitable substance instead of forming it in plaster. The blocks, plates, or dies, which are used to bear the action of frequent pressure, or many operations should be plain and smooth; in the under part such plates, blocks, moulds, or dies, are obtained in the manner first described, but

instead of casting them in plaster recipients they are to be made in one piece in boxes, formed of any suitable substance which is a bad conductor of heat, such as wood, paste-board, &c., the under part of the metal-mould being made perfectly smooth and even, in order that the said moulds may in every part sustain an equal pressure. These boxes should exceed in length and width the dimensions of their model, and their sides should exceed, in a small degree in height, the thickness to be given to the metallic casting. The boxes so prepared are placed on the lower plate or table of the press, and set on a perfect level. The alloy is poured into them as in the preceding operation, and when it has acquired a pasty kind of consistency the model is forced into it by turning the screw of the press as before stated.

Having explained this part of my invention, I will proceed to describe the process, manner, or method of making or manufacturing the embossed leather, basso-relievo figures, ornaments, or devices. My method of manufacturing embossed leather ornaments is, in truth, a means of forcing out such leather or skin of animals into all the countersunk interstices of the plate, die, or block, and is effected as follows :—First, with a wooden, bone, or copper instrument, similar to those used by sculptors for modelling, the workman presses the skin (which has been previously beaten in water until completely softened and thickened after the manner the operation of fulling acts upon cloth,) into all the cavities of the mould or die. This he effects in the manner following: he takes from the water the skin swollen by the liquid, and without wringing or pressing it, rolls and works it with his hands, so as to make it shrink ; that is to say, to increase its thickness at the expense of its width and length, after the manner of fulling. He then places it in the middle of the metal mould, and having ascertained the centre part of the design, he proceeds, by gently unrolling the edges of the skin, and then, with the ends of his fingers, begins

the operation of pressing the skin into the interstices of the die or plate, and, stretching out the leather, proceeding gradually from the centre of the plate to the outsides, for it is at the expense of the width and length of the skin that the cavities of the mould are filled. When the principal cavities are sufficiently covered or filled with leather or skin, the workman proceeds to fill up the middle cavities by means of the sculptors' tools above-mentioned, sometimes making use of a brush, with which he gently strikes the skin; he then presses on the surface of the leather a sponge, which has the double effect of compressing the leather into the minutest detail of the design or mould, and at the same time of absorbing the greater portion of the water which the skin has taken up. At this stage of the proceeding, either of the following methods may be employed to complete the embossing and drying of the leather, firstly, by means of heat; and, secondly, by the agency of an absorbing substance. In order to dry and finish the articles by heat, the mould or die containing the skins is to be placed on a chafing dish, until the temperature reaches from about 108° to 144° of Fahrenheit. During the drying operation, papier maché, or other suitable material, previously prepared, is forced into the deepest cavities of the skin or leather, in order to keep it in its place and prevent its receding from the die; the preparing tools and sponge being constantly pressed on all the parts, and in different directions, in order to cause the leather to adhere to the cavity until it and the papier maché are dry. The papier maché, with which the cavities are filled, may then be removed, and the operation is finished. The elasticity of the leather and its contraction in drying, allows of its being drawn out of those parts of the mould which otherwise would retain it, and, consequently, the mould need not be made of several pieces.

The second method of compressing and drying by the agency of an absorbing substance. The substance used

for this purpose must be reduced into fine powder, or very minutely divided; and I prefer materials, the particles of which are sufficiently void of cohesive properties, as to remain in a state of division even after being strongly and repeatedly pressed. The mould, after it has received the leather or skin from the hands and tools of the workman, as above described, is placed on the table or bed of the press around the mould, and upon the plate of the press. I place a frame of wood or metal, formed of side pieces without top or bottom, the top edges being above the surface of the mould about two or three inches when the design is not much in relief, and from about six to twelve inches or more when the embossing is raised in a greater degree. The frame is to be filled with fine saw-dust of wood, well dried, or dust of other suitable material, so that the die or mould may be covered with a layer of such dust. Above the frame is placed a plate or follower of such a size as will enter freely within it. The screw of the press being turned, compression takes place, and the saw-dust forces the leather into all the cavities of the mould. After a short time, the screw may be turned in a contrary direction, and the frame and saw-dust removed, the leather having acquired a sufficient consistency to be drawn out of the mould and dried by heat, or in the open air, according to circumstances. I have mentioned fine saw-dust of wood; I use it in preference, on account of its cheapness, and because it possesses all the necessary properties; but it is obvious, that the powder of any other substance capable of producing the same effects may be substituted. For instance, bran, sand, or other material, provided it is not of cohesive qualities, may be employed; and also fibrous and elastic substances may be used for this purpose, which should always be in a sufficient state of division.

By these means I produce the raised or embossed leather, ornamental mouldings, embossing, or basso-relievos, more or less embossed, for the decorating of apartments

or other purposes, such ornaments possessing great advantages on account of their correctness and rigidity, and the facility with which they may be applied to, or removed from, any situation. These ornaments may be allowed to retain a certain degree of the pliancy of the leather, or have a hardness given to them equal to that of wood or plaster, causing the leather, when it is sufficiently dry and warm to absorb a solution of gum lac dissolved in spirits of wine, or of resin in spirits of turpentine, or merely a solution of glue, and all the cavities in the back of the design must be filled up with paper, saw-dust, pulverized cork, mixed with glue or hot resin. When the basso-relievo ornaments or devices are used for the pannelling of rooms, in imitation of carving, the pieces of embossed leather should be united, so as not to shew the joints or junctions. Leather hangings for rooms have been, heretofore, made of leather, figured separately, and united together by seams; the straight lines thus produced are disagreeable to the sight, but by uniting these embossed leather ornaments, as hereafter stated, I produce leather pannels of required dimensions, without shewing any seam or perceptible line of junction. To attain this object, I take care to combine the parts of the pattern or design in such a manner, that on the edge of each figure or part of the design, there shall always be some strongly marked lines, which allow me to cut out such parts or figures, and pare two sides of the leather, without difficulty, each of the sides thus marked being placed over the edge of the opposite side of another piece of leather, to which a border has been purposely left; on this border is glued the pared edge of the first sheet, the second sheet being united in the same manner to a third, and so on. By this process I can make highly raised leather figures or medallions on large pannels. The pieces of leather or skin of the several parts of the design must be shaped in separated moulds, the two corresponding parts may afterwards be easily united if care has been taken to leave to

the one a border which is to lap over the edge of the other, the edge of the second part having been pared and cut exactly according to the line chosen for the junction. The embossed figures of these parts are made solid by filling them up with a mixture of tow or rags and glue, or with saw-dust, paper, corks, or any other suitable substance. It is obvious that these raised or embossed products may be painted, gilded, or silvered when rendered impervious by gum-lac, or any other suitable resinous substance, or they may be painted to represent wood, marble, or other material.

Having now described the nature of my invention and the manner of carrying the same into effect, I wish it to be understood, that what I claim as my invention, secured to me by the above in part recited letters patent, is, First, the improved process, manner, or method, herein-before set forth and described, by which I obtain copies or fac-similes of pieces of sculpture, carvings, models, castings, and other raised figures in basso-relievo on leather or skins of animals, and the means used therein, particularly the application and use of saw-dust, or other powdered or finely divided substance, for the purpose of forcing the skins into the cavities of the dies or moulds; and, in the second place, I claim the improved mode or method of making or forming the moulds, dies, or mattrixes, or apparatus, also herein described, as connected with the above process of producing basso-relievo devices on skins of animals.—In witness whereof, &c.

Claude Scroth.

Enrolled December 26, 1839.

Specification of the Patent granted to GEORGE WILDES, *of Coleman Street, in the City of London, Merchant, for Improvements in the Manufacture of White Lead.* Sealed September 4, 1841.

To all to whom these presents shall come, &c. &c.— I do hereby declare the nature of the said invention to consist in making carbonate of lead, commonly called white lead, by attrition of metallic lead in closed vessels, which vessels are partially filled with water, carbonic-acid gas, atmospheric air, and granulated lead. And in further compliance with the said proviso, I do hereby describe the manner in which the said invention is to be performed, by the following statement thereof (that is to say) :—

The ordinary lead of commerce is melted and poured through a metallic sieve into water. 200 lbs. weight of the lead thus granulated, or a greater or less quantity, if preferred, is then placed into a cylindrical, hexagonal, or square vessel, shaped like a shallow tub, made of wood, and lined with sheet lead. A hollow axis goes through the centre of the bottom of this tub, being fastened to it so that when the tub revolves the axis revolves with it: at its other extremity the axis communicates with a generator of carbonic acid gas, and with the interior of the tub. This tub is then placed so that the plane of its bottom forms an angle of forty degrees, or more or less, with the horizon, and by any convenient application of power, is made partly to revolve at the rate of twelve or fourteen times per minute. The inclination and the motion of the tubs are to be such that the pieces of lead, being carried by the revolution of the tub to its upper side, will roll down again over the surface of the bottom.

The granulated lead being placed in a tub, a sufficient

quantity of water must be added, being about half as much as the tub will contain in its inclined position; carbonic acid gas is introduced through the hollow axis, the lid or cover is put on, and the tub caused to revolve at the rate above given. The supply of gas must be regulated by observation. In twenty-four hours, or in less time, a large quantity of white lead in water will have been formed, which is to be drawn off in vats; thence, if advisable, washed, and then dried, ground, and packed for use in the ordinary way.

I do not claim as the said invention the use of metallic lead in the form of granulated lead, made by casting melted lead into water; nor the conversion of metallic lead into a white product by attrition in water; nor the use of any particular form of machinery for causing the attrition in water; but I do claim as the said invention the formation of pure carbonate of lead, known to painters as good white lead, by the attrition of lead in water in closed vessels supplied with carbonic acid gas, and the peculiar adaptation of the means above described to effect this object; to wit, a shallow tub with a hollow axis placed and revolved in the position above described and supplied with the ingredients abovementioned.—In witness whereof, &c.

George Wildes.

Enrolled March 4, 1842.

Specification of the Patent granted to WILLIAM GOSSAGE, *of Stoke Prior, in the County of Worcester, Manufacturing Chemist, for certain Improvements in Manufacturing Sulphuric Acid.*—Sealed May 8, 1838.

To all to whom these presents shall come, &c., &c.—My invention of certain improvements in manufacturing sulphuric-acid consists in certain processes or operations for obtaining sulphur from a certain compound of sulphur and iron, which I call residual sulphuret of iron, for the purpose of applying the sulphur so obtained to the manufacture of sulphuric-acid, and which sulphur I obtain combined with hydrogen forming sulphuretted hydrogen-gas. My invention also consists in obtaining a certain other useful substance from the said residual sulphuret of iron, by the same action which liberates the sulphur therefrom. The compound I refer to, as residual sulphuret of iron is obtained under certain circumstances, when iron pyrites, is used for the manufacture of sulphuric-acid. Iron pyrites is a compound of sulphur and iron, in which the iron is combined with more than one equivalent proportion of sulphur. The use of iron pyrites for the manufacture of sulphuric-acid has been made the subject of a patent, the term of which has now expired, and according to the process described in the specification of this patent, the iron pyrites is exposed to the combined action of heat and atmospherical-air, which causes the decomposition of the iron pyrites, so that a portion of the sulphur contained therein is driven off, and combining with the oxygen of the atmosphere, forms sulphurous-acid, but the residual remaining from this operation still retains a large quantity of sulphur combined with iron, and I call this, residual sulphuret of iron, which I use for the purposes of my invention. In order to separate the sulphur from this residual sulphuret of iron, I cause the same to be acted on by muriatic-acid,

and I therefore obtain sulphuretted hydrogen-gas and muriate of iron, I introduce the residual sulphuret of iron, furnished with a pipe for conducting off the gas produced, and a second pipe so arranged that fluid can be introtuced into the vessel, without allowing the escape of gas through the same. By means of this second pipe, I introduce into the said vessel a quantity of liquid muriatic-acid at intervals, which acid re-acts immediately on the residual sulphuret of iron, and occasions a rapid production of sulphuretted hydrogen-gas, which passes off by the gas-pipe, and may be used as it escapes therefrom, but I prefer to collect the gas in a gas-holder. The muriatic-acid, by its action on the residual sulphuret of iron, produces also liquid muriate of iron, and when the acid becomes entirely or nearly saturated with iron, I inject steam into the liquid by means of a pipe introduced into the said vessel; one end of such pipe extends below the surface of the liquid muriate of iron, and the other end is connected with a steam-boiler and furnished with a stop-cock to regulate the admission of steam into the vessel. The object of this injection of steam is to expel the last portions of sulphuretted hydrogen-gas from the liquid muriate of iron, and this being effected I run off the liquid from the vessel, and I concentrate the same in leaden boilers till it has acquired a proper strength; and by cooling I obtain from it chrystals of muriate of iron, which are suitable to most of the purposes for which sulphate of iron is used. For effecting the action of muriatic-acid on the residual sulphuret of iron, I prefer to use a vessel cut out of solid stone, and to have stone pipes for the introduction of the acid and the steam, the vessel having a leaden cover made tight by luting, and a leaden pipe for conveying off the gas.

Having obtained sulphur in the state of sulphuretted hydrogen-gas, from the residual sulphuret of iron herein referred to, I use this gas for manufacturing sulphuric-acid, by causing the gas to undergo combustion with

atmospherical-air. I effect this combustion in the same way that coal-gas is burned, by passing the gas through burners, similar to those used for coal-gas, and this combustion produces sulphurous-acid; I place these burners in connexion with an oven or small chamber, which is connected with a large chamber suitable for the conversion of sulphurous into sulphuric-acid, and in this large chamber the sulphurous-acid produced by the combustion of the sulphuretted hydrogen-gas, being mixed with nitrous vapours, in the same manner as in the manufacture of sulphuric-acid, by the combustion of sulphur the like result is obtained, namely the conversion of the sulphurous into sulphuric-acid.

I have described certain apparatus, which I prefer to use, for the purpose of this my invention; but I do not confine myself to the use of the apparatus herein described, nor do I claim any exclusive right or privilege to the use of such apparatus. I claim as my invention the residual sulphuret of iron, herein described, for liberating the sulphur therefrom by means of muriatic-acid, for the purpose of applying the sulphur so liberated to manufacturing sulphuric-acid; and I claim also the production of muriate of iron from the said residual sulphuret of iron, by the same action that liberates the sulphur therefrom.—In witness whereof, &c.

William Gossage.

Enrolled November 8, 1838.

Specification of the Patent granted to THOMAS ROBERT SEWILL, *of Carrington, in the County of Nottingham, Lace Manufacturer, for certain Improvements in Obtaining Carbonic-acid from certain Mineral Substances.* —Sealed December 31, 1840.

To all to whom these presents shall come, &c. &c.—I would first premise that within the last few years, carbonic-acid has become an article of great consumption, especially with manufacturing chemists, who use it extensively in the production of alkaline, earthy, and metallic carbonate; and consequently to obtain this acid at a cheap rate, and free from combination with a large volume of any other gas, has become a subject of great importance to the arts.

Heretofore carbonate-acid has been obtained by various methods, such as the combustion of charcoal in atmospheric-air, and by the decomposition of native earthy carbonates, through the agency of sulphuric or of muriatic-acid. The first of these methods yields carbonic-acid, mixed with large portions of atmospheric-air, and other gases, which impede or retard its action upon the substances with which it is intended to be combined; and the latter method is attended with great expense, arising from the cost of the strong acid employed. This latter method yields the carbonic-acid in a comparatively pure state, which is extremely desirable for most purposes of manufacture, and, although the cost is very great, has been preferred in many cases to the cheaper method of producing the acid by the combustion of charcoal in atmospheric-air.

The object of these improvements is to obtain carbonic-acid in nearly a pure state, and at a small expense, and which is accomplished by heating certain mineral substances to a red heat in vessels, from which the carbonic-acid evolved can be conducted to gas-holders, and there preserved for use.

The mineral substances which I use, and the apparatus which I employ, will be understood from the following description:—

I take any of those minerals which contain a large proportion of carbonate of magnesia, and which are known by the names of bitter spar, dolonite, and magnesian-limestone; or I take that description of ironstone which contains a large proportion of carbonate of iron, preferring, however, those minerals which contain carbonate of magnesia.

These minerals or any of them, (say in pieces from one ounce weight upwards, to not exceeding about two pounds,) I place in a retort, such as is ordinarily employed in obtaining coal-gas for the purpose of illumination, and in such retort, the minerals are heated to red-heat, in which state, they give off carbonic-acid gas in great abundance. This gas is to be conducted into an hydraulic-main, and from thence into a purifying vessel containing small gravel or coarse sand, or a mixture of them, or any similar granular substances, which are to be moistened with water, or a dilute solution of soda, through the interstices between which granular substance the gas must be passed, in order to arrest any particles of dust or of decomposed organic matter which I find such minerals usually contain; and from this vessel, the carbonic-acid-gas is to be conducted into an ordinary gas-holder, wherein it is to be retained for use.

I therefore claim, as my improvements in obtaining carbonic acid under the above in part recited letters patent, the use of the above mentioned minerals, when heated in such vessels as will admit of the carbonic acid being conducted and collected into receivers as above stated.—In witness whereof, &c.

THOMAS ROBERT SEWILL.

Enrolled June 30, 1841.

Specification of the Patent granted to ROBERT WARINGTON, *of South Lambeth, in the County of Surrey, Gentleman, for Improvements in the Operation of Tanning.*—Sealed March 16, 1841.

To all to whom these presents shall come, &c. &c.—My improvements are applicable to all kinds of hides or skins, whether dry, salted, or fresh.

First, for soaking or preparing the hides or skins for unhairing; this I do by means of the carbonates of potass or soda, the latter from its cheapness is to be preferred, and dissolved in water, in the proportion of from one to two pounds of the carbonate to ten gallons of water.

Second, for the preparing the hides and skins for unhairing and swelling them at the same time, or for swelling them only, and this I do by various agents, which for simplicity of explanation, I will divide into three classes, first, baryta, potass, soda; second, muriatic-acid, nitric-acid, and oxalic-acid, and all other acids (except the sulphuric); and thirdly, vegetable matters, as the culinary rhubarbs, sorrel, apple marc, vine cuttings, and many others, which from locality and other circumstances may be economically employed. Of the first class, I prefer the use of soda, in the proportion of half a pound to one pound of dry carbonate of soda to ten gallons of water, and rendered caustic by about half its weight of fresh burnt lime. Of the second class, I prefer, from its cheapness, the muriatic-acid, which I use in the proportion of from half a pound to two pounds of the acid of commerce of specific gravity 1.17, mixed with ten gallons of water. Of the third class, I prefer the culinary rhubards, bruised and mixed with water, in the proportion of from one to ten pounds of the rhubarb per gallon of water. As the details of the method of unhairing and fleshing the hides or skins when ready, is the same exactly as that usually

followed, and is well known to all practical men, it would be useless to state them here.

Third, for the use of the carbonates of ammonia in the operation of graining, and this I employ in the proportion of from half a pound to four pounds dissolved in ten gallons of water.

Fourth, for the use of green vegetable matter, bruised as culinary rhubarb, bruised potatoes, &c., or chemical agents, capable of deoxidizing or preventing oxidation, as gum, starch, certain compounds of sulphur, &c., which are to be mixed in small proportions with the tanning material, as barks, divi divi, or extracts, as kino, catechu, &c.; the proportion in which these agents may be employed, are so various, and dependent on the tanning agent used, that it is impossible to give an accurate proportion, but from $\frac{1}{100}$ part to $\frac{1}{10}$, supposing oak bark to be employed.

Fifth, for the use of bichromate of potass in solution, or diluted sulphuric-acid, for the preservation of animal matter, so as to prevent putrefaction. When the bichromate of potass is used, I employ from one-eighth to half a pound to 100 gallons of water; and in the case of sulphuric-acid, from one-fourth to one pound to ten gallons of water. Into either of these solutions, the skins, or any other animal substances, in their moist state is to be immersed and kept from the dust. I do not claim the use of any of the proportions hereinbefore given, as these must be regulated by the nature of the material operated upon, and the temperature of the air and season when it is employed.

But what I claim is, First, the use of carbonates of soda or potass for soaking the hides or skins, so as to enable the hair being readily removed.

Secondly, the employment of baryta, potass, soda, muriatic-acid, nitric-acid, oxalic-acid, and any other acid (except the sulphuric), as also vegetable matters, as culi-

nary-rhubard, sorrel, apple marc, &c., for the purpose of facilitating the removal of the hair, and at the same time, swelling the hide or skin, or for swelling them only.

Thirdly, the use of the carbonates of ammonia as a grainer, for the purpose of graining hides or skins.

Fourthly, the employment of vegetable matters and chemical agents, capable of retarding oxidation, such matters or agents to be used with the tanning agent employed.

Fifthly and Lastly, the use of bichromate of potass in solution or diluted sulphuric-acid, for preserving skins or other animal substances.— In witness whereof, &c.

ROBERT WARINGTON.

Enrolled September 16, 1841.

Specification of the Patent granted to CHARLES PAYNE, *of South Lambeth, in the County of Surrey, Chemist, for Improvements in Preserving Vegetable Matters, when Metallic and Earthy Solutions are employed.*— Sealed July 9, 1841.

To all to whom these presents shall come, &c. &c.— My invention relates to a mode of preserving vegetable matters, by causing them to to be impregnated with solutions of metallic or earthy matters, and then by chemical decomposition, to obtain the preserving matters employed in an insoluble state within the substance of the vegetable matter treated, when such effects are obtained by the combined processes of exhaustion, pressure, and chemical decomposition. And in order that my invention may be most fully understood and readily carried into effect, I will proceed to explain the means pursued by me; first remarking, that there are many metallic and earthy matters which are known as preservative of vegetable matters from decay and from burning with flame: it is

not, therefore, my intention to enter into a particular description thereof, my invention relating to a mode of applying such matters as above stated, and not to the use or application of such preservative matters generally. I will therefore confine my explanation to the use of one metallic solution and one earthy matter in solution, together with the use of suitable matters in solution for decomposing the metallic or earthy matters used. The wood or other vegetable matter to be preserved, is placed in a strong vessel capable of bearing considerable pressure, and of a size depending on the dimensions or quantity of the vegetable matters to be preserved at one time, and as good a vacuum is to be obtained as possible, either by air pumps or otherwise, as is well understood, by which the air will be exhausted from the fibres of the vegetable matter. I then fill the vessel with the earthy or metallic solution I propose to use, and allow it to stand for a short time; or I nearly fill the vessel, in the first instance, with the liquor, and then exhaust them. By the use of force-pumps or by columnal pressure I cause the liquor in the vessel to be pressed into the vegetable matter; and I find it desirable to withdraw a quantity of the liquor from time to time, keeping up the pressure of supply by which the process will be facilitated: and when the vegetable matter is well impregnated with the metallic or earthy solution, time for doing which will vary with the nature and quantity, and on the dimensions of the pieces of the vegetable matters treated; but the workman, with a little practice, will soon judge of the time required: and having saturated the vegetable matter in the vessel, I then withdraw the liquor from the vessel, and fill it with a solution suitable for decomposing the matter of the previous liquor by double or single decomposition, according to the result desired to be obtained, all which is well understood by chemists, and will not be required to be described in this my specification. Supposing the solution to be used be a strong solution of sulphate of iron, either hot or cold,

having impregnated the wood or other vegetable matter therewith, I then apply a solution of any of the carbonate alkalies to decompose the solution of iron, I prefer carbonate of soda for that purpose, but any suitable known substances which will decompose the salt and render the oxide of iron insoluble, may be resorted to, and by means of vacuum and pressure, as above explained, I cause the liquor to penetrate into the wood or other vegetable matter under process, and decomposition will follow; and in some cases it is desirable to dry, or partially dry, the wood between the processes of impregnation with the different liquors in order to obtain the matters of the first solution in a more concentrated form within the substance of the wood, in order to get rid of part of the aqueous matter therefrom, to facilitate the next process of impregnation and decomposition by exhaustion and pressure, as above explained. In this manner may other metallic solutions, particularly those of the cheaper metals be used, employing proper means of decomposing the same as above explained. In respect to earthy matters, supposing a strong solution of alum to be used, I employ a solution of carbonate of soda of a strength proper for the solution of alum, or other proper and well known means of decomposing the solution of alum may be resorted to for precipitating the alumina, and thus render it insoluble in the substance of the wood or other vegetable matter treated: and in this manner may solutions of lime and other earthy matters be employed, using suitable decomposing substances in solution.

Having thus described the nature of my invention and the manner in which the same is to be performed, I would have it understood that I am aware that wood and other vegetable matters have been before impregnated with various metallic and earthy matters, for the purpose of preserving vegetable matter, and I am aware that it has been before proposed to use exhaustion and pressure to impregnate wood and other matters with preservative solutions, and I mention these in order to state that I do not claim the

same when separately considered or when uncombined with a process of decomposition as above described; and I would have it understood that what I claim is the mode of preserving woods or other vegetable matters by caus- them to be impregnated with a solution of metallic or earthy matter, and then, by chemical decomposition, to obtain the matters employed in an insoluble state in the substance of the vegetable matter, when such effects are obtained by the combined processes of exhaustion, pressure, and decomposition, as above described.—In witness whereof, &c.

Charles Payne.

Enrolled January 9, 1842.

ALTERATIONS AND DISCLAIMERS IN SPECIFICATIONS.

In the Matter of Letters Patent granted to William Gossage, *of Stoke Prior, in the County of Worcester, Manufacturing Chemist, for his Invention of certain Improvements in Manufacturing Sulphuric-Acid.*—Sealed May 8, 1838.

Disclaimer or memorandum of alteration entered by the said William Gossage.

I, the said William Gossage, do hereby declare that in the first part of my specification of the above-mentioned letters patent, I have made mention of a patent, which patent has nothing whatever to do with the subject of my invention or discovery. That I have since consulted with my counsel learned in the law, and other persons duly competent to advise me thereon, and I find that the mention of such letters patent was uncalled for and quite unnecessary. That it interrupts the proper reading of the introductory remarks, which I had made for the information and benefit of the public. That the intention of such letters patent in no way interferes or applies to the description of my process or invention, afterwards described in my specification. That I have been advised

to amend my said specification, by leaving out and omitting the following words therein (that is to say) :—" has been made the subject of a patent, the term of which has now expired, and according to the process described in the specification of this patent, the iron pyrites is exposed to the combined action of heat and atmospherical-air, which," as such memorandum of alteration or omission, does not alter or in any way interfere with the description of my invention or process, described in my specification ; and such memorandum of alteration is not made in any part of the written description of my invention, but only in the introductory remarks, which I thought proper to lay before the public. And for the reasons aforesaid, I, the said William Gossage, do hereby disclaim and omit the following words in my spefication (that is to say) :—" has been made the subject for a patent, the term of which has now expired, and according to the process described in the specification of this patent, the iron pyrites is exposed to the combined action of heat and atmospherical-air, which."—In witness whereof, &c.

SELECTED PAPER.

Remarks on Machines recipient of Water Power; more particularly the Turbine of Fourneyron. By Professor Gordon (Glasgow).

Notwithstanding the diminished importance of water power since the almost universal application of the steam-engine, some situations may still be found, in the mining districts of Cornwall, of Derbyshire, and of Cumberland, the Highlands of Scotland, and generally in the districts comparatively destitute of cheap fuel, where it is desirable to render falls of water available.

The theory of water power, as it now stands, may be announced in general terms thus : " The mechanical effect obtained is equal to that of the moving power employed,

minus the half of the *vis viva* which the water loses on entering the machine, and minus the half of the *vis viva* which the water possesses when it quits the machine."

Bernoulli recognized the second cause and soon after, Euler, the first. Borda, in his "Mémoire sur les Roues Hydrauliques," in 1767, gave the proposition in precise and general terms: whence he concluded, that to produce its total mechanical effect, "the water serving as moving power must be brought on to the wheel with impulse, and quit it without velocity."

This principle being admitted, the circumstances next to be considered are: the height of fall, the supply of water, and the nature of the work to be done.

These positions being laid down, the author proceeds to examine the relative efficiency of water-wheels of various constructions.

The undershot wheel acted upon by the velocity of the water when confined in a rectilinear course, or when hung freely in a stream: in the former case, the efficiency of the machine is equal to 32 per cent, or nearly one-third; in the latter, the ratio is 42 per cent, or about two-fifths.

The breast-wheel is generally applied to falls from 4 to 8 feet; in these the efficiency reaches as high as 60 to 65 per cent. of the mechanical effect of the fall of water. The buckets being filled to two-thirds of their capacity, their velocity is seldom less than from 7 to 9 feet per second.

The consideration of this wheel led Poncelot in 1824-25 to the invention of the "undershot wheel with curved floats," the efficiency of which has been found equal to from 65 to 75 per cent. The velocity of this may be 55 to 60 of that of the effluent water—a velocity equal to that due to nearly the whole height or fall; hence the efficiency becomes "about double that of the ordinary undershot-wheel." This wheel has not been much employed in Great Britain, although frequently used in France and Germany.

The overshot-wheel is most generally employed in

Great Britain for falls beyond 10 feet in height, and some excellent examples occur for work of every description, from rolling iron to spinning silk. Its efficiency averages 66 per cent. but has risen as high as 82 per cent.

The economical use of water as a moving power, varying in particular cases, rendered desirable the discovery of a receiver capable of general application, in all circumstances of height of fall, quantity of water, and amount of work to be done; and, after intense study, Fourneyron produced the Turbine, the peculiarities of which form the subject of the paper.

The imperfect horizontal water-wheels, which have been used for centuries in the mountain districts of central Europe and in the northern Highlands, are mentioned; then are noticed the experiments of M. M. Tardy and Piobert, and the allusion by Borda to horizontal wheels; then a general description is given of the numerous experiments made up to the year 1825, when M. Burdin constructed wheels in which the water was received at the circumference of a vertical cylinder, descended in conduits, placed in a helical form rouud the surface of the cylinder, and made its escape at the bottom: the efficiency of these wheels was stated to be 75 per cent., but no exact experiments were ever instituted.

The defects in all previous machines led to the invention of the Turbine, as it is now designed by M. Fourneyron: its construction may be compared to one of Poncelot's wheels with curved bucketts, laid on its side, the water being made to enter from the interior of the wheel, flowing along the buckets, and escaping at the outer circumference: centrifugal force here becomes a substitute for the force of gravity.

The mechanical construction of the Turbine is then given, and its action is thus described. The water, when admitted to the reservoir, rises to a certain level, exercising a hydrostatic pressure proportional to the height of the column, and, on the sluice being raised, it escapes

with a corresponding velocity in the direction of the tangent to the last element of the guide-curves, which is a tangent to the first element of the curved buckets; the water pressing without shock upon the buckets at every point of the inner periphery, causes the wheel to revolve, then passes along the buckets, and escapes at every point of the outer periphery; by which arrangement the size of the machine even for a large expenditure of water is kept within narrow limits.

The advantages of the Turbines are stated to be—

1st. That they are with like advantage applicable to every height of fall, expending quantities of water proportional to the square root of the fall, their angular velocities being likewise proportional to these square roots.

2nd. That their net efficiency is from 70 to 75 per cent.

3rd. That they may work at velocities much above or below that corresponding to the maximum of useful effect, the useful effect varying very little from the maximum nevertheless, and—

4th. They work at considerable depths under water, the relation of the useful effect produced to the total mechanical effect expended not being thereby notably diminished.

These advantages are stated to have been realized in the extensive practice of M. Fourneyron, of M. Brendel, in Saxony, and of Herr Carliczeck, in Silesia, as well as other engineers.

A comparison of the theory and practice of the construction is then instituted, and the following conclusion is drawn:—That if one Turbine has been constructed, which works well under a known fall, expending a volume of water exactly measured, this Turbine would serve as a type for all others.

Knowing the fall and the volume of water to be expended, the Turbine would be made similar to its type. Its linear dimensions would be those of the type, directly as the square roots of the volume of water, and inversely as the fourth roots of the heights of fall. Its angular velocity would be to that of the type, directly as the fourth

roots of the cubes of the heights of fall, and inversely as the square roots of the volume of water. These practical rules were first made manifest by M. Combe, of the Ecole des Mines.

A general review is then given of most of the Turbines erected by M. Fourneyron at Pont sur l'Ognon, at Fraisans, at Niederbronne, and at Inval, upon which last were tried the experiments which completely established the reputation of the Turbine as an applicable machine. The details of these experiments are given, whence the mean results appear to be, that the height of fall being 6 feet 6 inches,

With an expenditure of 35 cube feet of water per second, the efficiency was— = 0·71
„ 63 cube feet „ = 0·75
„ 79 „ (for which it was constructed) = 0·87
„ 126 „ = 0·81
„ 144 „ = 0·80

These experiments were tried by the application of Prony's Brake Dynamometer, to the vertical shaft of the Turbine itself.

M. Arago's proposition for employing the power of one branch of the river Seine upon Turbines, to replace the wheels at the Pont Notre Dame, thus giving about 2000 horse power for supplying Paris with water, is then mentioned, as also the results of experiments with very low falls; shewing that

With a fall of 3 feet 9 inches, the efficiency of the Turbine was— = 0.71
„ 2 feet „ = 0·64
„ 10 inches „ = 0·38

The Turbines at Mulbach and Moussay are mentioned, as are the failures of several of these machines constructed by other engineers; and the paper concludes with an account of a Turbine at St. Blazeux in the Black Forest, where the height of the fall is 345 feet, the quantity of water 1 cube foot per second, and the reported efficiency from 80 to 85 per cent.*

* From the Proceedings of the Institution of the Civil Engineer, 1842, p. 92.

NOTICE OF EXPIRED PATENTS.

(Continued from page 373, vol. 17.)

Baron Charles Wetterstedt, of Commercial Place, Commercial Road, in the county of Middlesex, for a liquid or composition for waterproofing and strengthening leather.—Sealed July 1, 1828.—*(For copy of specification, see Repertory, Vol. 9, third series, p.* 224.)

John Baring, of Broad Street Buildings, in the city of London, Merchant, for a new and improved mode of making or manufacturing machines for cutting fur from skins for the use of hatters, to be called "Cant-twist Blades fur cutter."—Communicated by a foreigner residing abroad.—Sealed July 3, 1828.

John Johnston Isaac, of Star Street, Edgeware Road, in the county of Middlesex, Engineer, for improvements in propelling vessels, boats, and other floating bodies.—Sealed July 5, 1828.—*(For account of specification, see Repertory, Vol.* 8, *third series, p.* 474.)

Thomas Revis, of Kennington Street, Walworth, in the county of Surrey, Watchmaker, for an improved method of lifting weights.—Sealed July 10, 1828.—*(For account of specification, see Repertory, Vol.* 8, *third series, p.* 363.)

John Hawks, of Weymouth Street, Portland-Place, in the county of Middlesex, Iron Manufacturer, for an improvement in the construction of ship's cables, and hawser-chains.—Sealed July 10, 1828. —*(For account of specification, see Repertory, Vol.* 8, *third series, p.* 365, *and for copy of specification, see Vol.* 11, *p.* 203.)

John Henry Anthony Gunther, of Camden Town, in the county of Middlesex, Piano-Forte Manufacturer, for certain improvements on piano-fortes.—Sealed July 10, 1828.

William Muller, of Doughty Street, Bedford Row, in the county of Middlesex, Captain of the German Legion, for an instrument or apparatus for the purpose of teaching or instructing in mathematical geography, astronomy, and other sciences, for the use of resolving problems in navigation, spherics, and other sciences.—Sealed July 10, 1828.

John Evans, the younger, of Moreton Mills, near Wallingford, in the county of Berks, Paper Maker, for certain improvements on steam-engines.—Sealed July 12, 1828.—*(For copy of specification, see Repertory, vol.* 10, *third series, p.* 141.)

Benjamin Rider, of Redcross Street, Southwark, in the county of Surrey, Hat Tip Manufacturer, for certain improvements in the manufacture of hats, which he intends to denominate "Rider's Patent Hat Tips."—Sealed July 17, 1828.—*(For copy of specification, see Repertory, Vol.* 8, *third series, p.* 734.)

Joseph Jones, of Amleoch, in the county of Anglesea, in North

Wales, Gentleman, for an improvement in certain parts of the process of smelting or obtaining metallic copper from copper ore.—Sealed July 17, 1828.

JOSHUA TAYLOR BEALE, of Church Lane, Whitechapel, in the county of Middlesex, Engineer, and GEORGE RICHARDSON PORTER, of Old Broad Street, in the City of London, Merchant, for a new mode of communicating heat for various purposes.—Sealed July 19, 1828.—(*For copy of specification, see Repertory, vol.* 8, *third series, p.* 141.)

ANTON BERNHARD, of Finsbury Square, Middlesex, Engineer, for a method, principle, or apparatus for raising water or other fluids.—Sealed July 24, 1828.—(*For account of specification, see Repertory, Vol.* 8, *third series, p.* 607.)

ROBERT WORNUM, of Wigmore Street, Piano-Forte Maker, for improvements on upright piano-fortes.—Sealed July 24, 1828.

(*To be continued.*)

LIST OF NEW PATENTS.

WILLIAM YOUNG, of Queen Street, London, Lamp Maker, for improvements in lamps and candlesticks.—Sealed May 28, 1842.—(*Six months.*)

PHILIP JACOB KAYSER, of Gracechurch Street, for improvements in the construction of lamps.—Sealed May 31, 1842.—(*Six months.*)

HENRY PHILLIPS, of Exeter, Chemist, for improvements in purifying gas for purposes of light.—Sealed May 31, 1842.—(*Six months.*)

RICHARD WATSON, JUNIOR, of Cloth Fair, London, Gas Fitter, for improvements in draining land, embankments, and cutting of railways, and other engineering works.—Sealed May 31, 1842.—(*Six months.*)

HENRY WILKINSON, of Pall Mall, Gun Maker, for improvements in unloading shipping, especially those vessels called colliers.—Sealed May 31, 1842.—(*Six months.*)

LOUIS NICHOLAS DE MECKENHEIM, of Austria, but now of London, Engineer, for improvements in the manufacture of iron.—Sealed May 31, 1842.—(*Six months.*)

HENRY BEAUMONT LEESON, of Greenwich, Doctor of Medicine, for improvements in the art of depositing and

manufacturing metals and metal articles, by electro-galvanic agency, and in the apparatus connected therewith.—Sealed June 1, 1842.—(*Six months.*)

William Henry Kempton, of South Street, Pentonville, Gentleman, for improvements in the manufacture of candles.—Sealed June 1, 1842.—(*Six months.*)

James Reid, of Bishop Stortford, Statuary and Mason, for improvements in tiles, slating, and the construction of water tight joints, and in the covering and casing of buildings and other erections.—Sealed June 2, 1841.—(*Six months.*)

Henry Jubber, of Oxford, Confectioner, for certain improvements in kitchen ranges, and apparatus for cooking.—Sealed June 2, 1842.—(*Six months.*)

Benjamin Aingworth, of Birmingham, Gentleman, for certain improvements in the manufacture of glass, for the purpose of producing glass which may be used for the purposes to which plate-glass and window-glass are usually applied.—Sealed June 4, 1841.—(*Six months.*)

Edmund Tuck, of the Haymarket, Silversmith, for certaim improvements in the covering, or plating with silver, various metals, and metallic alloys.—Sealed June 4, 1842.—(*Six months.*)

William Irving, of Regent Street, Lambeth, Engineer, for an improved corn drill or machine for sowing all kinds of seed or grain.—Sealed June 7, 1842.—(*Six months.*)

John Woodcock, of Manchester, Millwright, for certain improvements in the construction of steam-engines.—Sealed June 7, 1842.—(*Six months.*)

James Nasmyth, of Manchester, Engineer, for certain improvements in machinery or apparatus for forging, stamping, and cutting iron and other substances.—Sealed June 9, 1842.—(*Six months.*)

Charles Searle, of Bath, Gentleman, for improved preparations of téa, coffee, cocoa, and milk.—Sealed June 9, 1842.—(*Six months.*)

Joseph Chatwin, of Birmingham, Lamp Maker, for

certain improvements in the construction of cocks.—Sealed June 9, 1842.—(*Six months.*)

John George Hughes of the Strand, General Agent, for a new application of telegraphic signals, and the mode of applying the same.—Sealed June 9, 1842. — (*Six months.*)

James Anthony Emslie, of the borough and county of Newcastle-upon-Tyne, Civil Engineer, for certain improvements in pumps.—Sealed June 9, 1842. — (*Six months.*)

Stephen Bencraft, of Barnstaple, Gentleman, for improvements in the construction of saddle-trees.—Sealed June 9, 1842.—(*Six months.*)

Arthur Howe Holdsworth, Brook Hill, Devon, Gentleman, for improvements in constructing certain parts of ships and vessels, in order to arrest the progress of fire, and for regulating temperature.—Sealed June 11, 1842.—(*Six months.*)

Richard Garrett, of Leiston Works, Suffolk, Agricultural Implement Maker, for improvements in the construction of horse-hoes, scarifier, drag-rakes, and drills for cultivating land.—Sealed June 13, 1842.—(*Six months.*)

Thomas Banks, of Manchester, Engineer, for certain improvements in the construction of wheels and tyres of wheels to be employed upon railways.—Sealed June 13, 1842.—(*Six months.*)

Moses Poole, of Lincoln's Inn, Gentleman, for improvements in obtaining the colouring matter from wool and woollens dyed with indigo.—Sealed June 13, 1842. —(*Six months.*)

William Cotton, of Leytonstone, Essex, Esquire, for an improved weighing machine.—Sealed June 13, 1842.—(*Two months.*)

Daniel Williams, of Oxford, Slater, for improvements in covering ridges and hips of the roofs of buildings.—Sealed June 13, 1842.—(*Six months.*)

Isaac Moss, of Macclesfield, Silk Trimming Manufac-

turer, for improvements in the manufacture of covered buttons, ornaments, and fastenings for wearing apparel.—Sealed June 13, 1842.—(*Six months.*)

William Morrett Williams, of 163, Fenchurch Street, Lock Manufacturer, for certain improvements in the construction of locks and keys, which he proposes to call "Williams's Lock and Key improved."—Sealed June 13, 1842.—(*Six months.*)

Henry Hough Watson, of Bolton Le Moors, Consulting Chemist, for certain improvements in bleaching, changing the colour of, and otherwise preparing, purifying, and refining tallow, and certain other organic substances, mixtures, compounds, and manufactures.—Sealed June 21, 1842—(*Six months.*)

Joseph Bunnett, of Deptford, Engineer, for certain improvements in pavements for streets, roads, and other surfaces, and in machinery for producing and repairing the same.—Sealed June 21, 1842.—(*Six months.*)

John Dickson, of Brook Street, Holborn, Engineer, for improvements in rotatory-engines and boilers, in stopping railway-carriages, and in machinery for propelling vessels, part of which improvements are applicable to propelling air and gasses.—Sealed June 21, 1842.—(*Six months.*)

Frederick Gye, Junior, of South Lambeth, Surrey, Gentleman, for improvements in binding pamphlets, papers, and other documents.—Sealed June 21, 1842.—(*Six months.*)

Thomas Gaunt, of Dalby Terrace, City Road, Gentleman, for improvements in the means of applying any such power as is or may be used for propelling vessels or carriages to produce locomotion thereof.—Sealed June 21, 1842.—(*Six months.*)

Henry Beuley, of Dublin, Licentiate Apothecary and Chemist, for an improved chalybeate water.—Sealed June 23, 1842.—(*Six months.*)

THE

REPERTORY

OF

PATENT INVENTIONS.

No. CIV. NEW SERIES.—AUGUST, 1842.

Specification of the Patent granted to SAMUEL LAWSON, *of Leeds, in the County of York, and* JOHN LAWSON, *of the same Place, Engineers and Co-partners, for Improvements in Machinery for Spinning, Doubling, and Twisting Flax, Wool, Silk, Cotton, and other Fibrous Substances.*—Sealed January 2, 1840.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—These improvements in machinery for spinning, doubling, and twisting flax, wool, silk, cotton, and other fibrous substances, apply to that class or description of machinery commonly called or known as the throstle machinery, that is, in which spindles, with bobbins and flyers are used to effect these operations, and the objects of these improvements are to effect economy of space in the machinery, and in the room the machines occupy; also to make one set of parts serve for two sets, or rows, of spindles and bobbins, and which improvements we attain by causing two sets of rovings, yarns, or threads, to be spun, twisted, or doubled, from one set of drawing and top rollers, each length of the rovings in spinning, or each pair or more of yarns or threads in doublings, being con-

ducted to separate spindles and flyers, from the nip or points of contact of the lower row of the drawing-rollers. The spindles and flyers being placed in two rows, at equal distances from a perpendicular lever, drawn from the nip or point of contact of the lower rollers, and in such manner that the yarns or threads shall be conducted to the flyers at equal angles, and subjected to equal tension and drag or draft. All of which will be better understood by reference to the accompanying drawings, and the following description thereof (that is to say) :—

Description of the Drawing.

Fig. 1, is a side elevation of one of these improved spinning frames, having only twenty-four spindles, and as adapted for spinning flax, part of the guide-plates with the apron being shewn in section, the better to shew the spindles and flyers in each row.

Fig. 2, is an end representation or partial transverse section of the same; and,

Fig. 3, is an outline section, to shew more clearly the line or direction in which the rovings or yarns are passed from the bobbins or spools, between the sets of drawing-rollers to the flyers and spindles, and the situation of the same on each side of the perpendicular line, *a*, *b*, shewn dotted in the figure. And we would here remark, that the particular construction of the various ordinary parts of the machinery, forms no part of this invention, neither the manner of actuating any of them, such as driving the spindles and flyers, the method of gaining the copping motion, nor in fact the mode of applying the driving power, or of actuating the various working parts, as these will be varied in different kinds of machines; and, therefore, we shall proceed, first, to point out the several parts of the machinery, and shew how they are set in motion, as represented in the drawings, and then state in what we consider our improvements to consist. *a*, *a*, is the frame-work and standard of the machine. B, B, is

the first or main driving-shaft, receiving its motion by a band passed from the steam-engine or other first mover, to the fast and loose pulleys or riggers on its end. C, C, are the rows of spindles passing through the fixed plate or cross-bar, D, their lower ends resting in cup-bearings on the other bar or plate, E, in the usual manner. F, is the copping-rail, or lifter supporting the bobbins, G, G; and H, H, are the flyers attached to the spindles, as in common. The copping or lifting motion of the bar, F, is effected by the heart-wheel or eccentric-cam, I, acting upon one end of a lever, the other being attached to the legs or vertical bars, K, K, which support the copping-rail, or the lifting motion, may be effected in any other convenient manner. L, L, are the bobbins or spools containing the roving threads or yarns, and are placed in any convenient situation, turning loosely upon pins or wires; and M*, and M, are the two ordinary sets of rollers. These pairs or sets of rollers, are constructed after the usual manner, and are actuated by the train of toothed-wheels and pinions leading from the main-shaft, B, to the axle, N, of the lower set of drawing rollers, M, as shewn in the drawings. O, O, is the trough containing the water for wetting the rovings or yarns when spinning or doubling flax, hemp, or such like fibrous materials, the trough is placed at or near to the centre or middle part of the machine. P, P, are the guide plates, for conducting and keeping the threads or yarns in their proper situations. These guide plates have an apron or shield, Q, for the purpose of preventing the water being thrown by centrifugal force from the flues of one row of spindles on to the bobbins of the row.

It will be seen by the drawings, that the roving threads or yarns are led or conducted first over the stationary longitudinal rods, R, R, then down under other like rods, S, S, and afterwards pass under another similar rod, T, situate within the bottom part of the trough, and

thereby the yarns or rovings are caused to pass through the liquid contained therein. These yarns, threads, or rovings, are caused to pass over the edges of the trough, and again meet at another longitudinal bar, U, where they are dressed, and pass over the opposite edges of this bar, and again meet at the nip or point of contact of the top or retaining rollers, M*, they then pass between the lower pair of drawing rollers, M, and as these latter rollers have a more rapid motion given them than the top pair, the rovers become elongated or drawn out. From the lower drawing rollers, the yarns or threads are passed through holes in the guides, P, P, to the eyes on the ends of the flyers, H, which by their rotation, cause the yarns or threads to become twisted or doubled, as the case may be, the same being wound upon the bobbins in the usual manner.

We would here remark, that when spinning, doubling, or twisting cotton, silk, or such like materials, the water trough may be dispensed with, or not, at pleasure; and it will be understood by all practical spinners, that when our improvements are applied to machinery for this purpose, the same will require proper arrangements of the parts to adapt them to effect these objects.

Having thus described and pointed out all the various working parts of this improved machinery, and the arrangement of the same, we would in conclusion remark, that what we claim as this invention, is the general arrangement and construction of throstle, or spinning, twisting, and doubling frames, or machinery of this class or description, whereby two sets or rows of spindles, bobbins, and flyers, placed at equal distances from the perpendicular line drawn from the nip or point of contact of the lower drawing-rollers, are made to act in conjunction with one set of drawing-rollers, and in such manner, that the two threads or yarns in spinning, or the two pairs or more of yarns or threads in doubling and

twisting, shall have equal tension strain or drag as herein above set forth.—In witness whereof, &c.

SAMUEL LAWSON.
JOHN LAWSON.

Enrolled July 2, 1840.

Specification of the Patent granted to WILLIAM DAVIS, *of Leeds, in the West Riding of the County of York, Machine Maker, for certain Improvements in Machinery for Dressing and Cleansing Woollen Cloths.** Sealed May 7, 1839.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—Our improvements in machinery for dressing and cleansing woollen cloths consist in a peculiar arrangement of the parts constituting a machine suited to that object. The forms and modes of adapting such parts or mechanical agents will be fully understood by reference to the drawing hereunto annexed, in which

Description of the Drawing,

Fig. 1, is an end elevation of the machine.

Fig. 2, an elevation of the reverse end; and

Fig. 3, a horizontal view of the machine as seen from above; the middle of the machine being broken away for the purpose of exhibiting some of the parts below. And here it may be observed, that no definite length of the machine is given, because that must depend on the breadth of the cloth intended to be operated upon by the machinery. The respective letters of reference in the drawing point out the same parts of the machine in all

* This patent was granted to said William Davis, and George Kinder, of Almondsbury, in the county of York, Cloth Dresser, but Specification was signed by Davis alone.

the figures. The machinery is mounted upon a rectangular cast-iron frame, the form of the ends of which are shewn in figs. 1 and 2, and these are firmly braced together by longitudinal and diagonal bars or rails; A, A, are two flat boards placed horizontally, the upper faces of which have a series of pointed wire brushes fixed upon them. These wires must be set in very small knots and not hooked at their points. When we employ wires of $\frac{1}{60}$ of an inch diameter, we find it desirable that they should not stand less than an inch and a half out of the wood. The boards are made to perform reciprocating movements, in lateral directions, by the action of vibrating levers, B, B, to which they are attached by the means hereafter described. D, D, are two horizontal beams or rollers intended to receive the cloth under operation, which cloth is to be drawn from one of the rollers, D, over the breast-beams, C, C, fixed in horizontal positions at the back and front of the top parts of the framing, and conducted to the other roller, D, as shewn by dots in figs. 1 and 2; and E, E, are two other rollers or shafts having ribs, intended to act as beaters for removing or beating off the loose wool from the surface of the cloth after the wires have acted upon it. The machinery is put in action by a strap leading from the rotary part of a steam-engine, or other first mover, applied to the rigger, F, or the main driving-shaft, G, G; or it may be driven by manual or other power communicated to the shaft, G. Upon this shaft there is also a wheel, H, affixed, from whence endless straps are conducted to pulleys attached to the axles of the beaters, E, E, as shewn in fig. 1. At the reverse end of the main-shaft, G, a pinion, I, is affixed, taking into a wheel, K, turning loosely upon the axle of one of the rollers, D, and also into an intermediate coupling-wheel, L, which takes into a similar wheel, M, turning loosely on the axle of the other roller, D. Hence by the rotation of the main-shaft both wheels, D, D, are made to revolve simultaneously in opposite directions for the purpose, when

either of them are locked to its shaft, of drawing the cloth from one roller and winding it on to the other roller, as it passes over the brushes and beaters above. In order to lock the wheel, K, or M, to its shaft, the clutch-apparatus, M, N, is applied; which apparatus is so well known to mechanics that no further description is necessary, except to observe that when the machine is in action the wheel must be locked to the shaft of that roller which is intended to draw and wind on the cloth, and the other roller allowed to turn freely by the draft of the cloth as it unwinds; but in order to keep the cloth in tension, a break, O, is made to bear upon friction-pulleys affixed to each of the rollers, D, D. Upon the main-shaft there is a bevil wheel, P, which takes into a bevil-pinion, Q, upon a crank-shaft, R: to this crank a connecting-rod, S, is attached, the reverse end of which rod works on a stud fixed to the under part of one of the boards, A. The vibrating-levers, B, B, carrying the boards, A, A, as described above, turn upon vertical axles, T, T, and hence by the rotation of the crank, R, the boards, A, A, are made to perform their recipocrating movements, and to brush the under-surface of the cloth as it passes over them. This arrangement is particularly designed for dressing and cleansing cloths in the raw thread state after scouring, which considerably reduces the labour in the process of burling: but we sometimes employ the same machine for raising the pile on the face of cloth previously to shearing it. In that case instead of the pointed wire brushes, we attach to the boards, A, A, teazles or wire cards, or any other things capable of effecting the same purpose; and we sometimes place bristles or wires around the periphery of the cylinders, E, E, between the ribs or beaters.—In witness whereof, &c.

WILLIAM DAVIS.

Enrolled November 7, 1839.

Specification of the Patent granted to ROBERT STIRLING NEWALL, *of Gateshead, in the County of Durham, Wire Rope Manufacturer, for Improvements in the Manufacture of Flat-Bands.*—Sealed November 16, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—Flat-bands as hitherto used in this country, in mining operations, driving machinery, and for other purposes, are generally composed of hemp, leather, wire, or chains, in various combinations, and the nature of my invention, consists in manufacturing such bands exclusively of iron or other metal, in the several manners hereinafter described.

My first improvement consists in manufacturing a flat-band, by subjecting a piece of iron or other metal of good quality (and I prefer that known as the best charcoal-iron, manufactured in the usual way by rolling, and of suitable weight and dimensions, according to the size of the band required,) to a process of drawing through rectangular orifices or dies of hardened steel or other material, in the same manner as in the ordinary and well known process of tube or wire-drawing.

Description of the Drawing.

The dies which I use, are represented in an end view, plan, and elevation, at figs. 1, 2, 3. *a*, is a sole-plate. *b*, a bridge through the top of which the screw, *c*, passes for the purpose of regulating the breadth of the orifice, between the drawing-edges, d^1, d^2, the length of it being regulated by changing the drawing-edges, d^3, d^4. The pieces, d^3, d^4, are also made of various thicknesses, to suit the different draughts, and I recommend that they be so proportioned, that the four sides of the piece of metal shall be drawn at the same time. It is of importance that the piece of metal to be operated upon, be

drawn through the die in a straight line at right angles to its edges; the edges, d^3, d^4, are made wider than the slot in the end of the bridge, so that they may not be forced through it; the die is fastened to a bench by bolts. As it is difficult to roll iron beyond a certain length, it may be convenient to draw it in a hot state through dies, and as in the process of drawing the metal becomes hardened, it may be necessary to anneal it by heating it in a furnace, and after the oxide has been removed from it by means of diluted sulphuric-acid, or other well known means, to repeat the process of drawing when cold. When a band of considerable length is required, it will be necessary, or it may be convenient to rivet two or more bands together. The method in which this junction is effected is of considerable importance. Various methods are shewn in the annexed drawing, and I prefer those represented in figs. 4 and 5, to that in fig. 6; scarfing the ends and rivetting in the manner recommended, is much preferable to welding or brazing, as the operation of hammering in welding gives a brittleness to the metal, which no subsequent process of annealing can remove, so as to give the hammered part the same strength which it had before; and in brazing the union of the two metals is not such as can be depended on or should be trusted to. These bands, when of iron, may vary in thickness from one twentieth to one-fourth of an inch, and in breadth according to the strength required; flat-bands manufactured in the way described, will be found to possess greater strength and durability than those of hemp or similar materials of the same weight; and if extreme lightness with the greatest degree of strength be required, steel may be used instead of iron. It may be advisable in some situations, where the iron becomes rapidly corroded, to make the band of copper, instead of iron or steel.

Having now described the nature of this my improvement in the manufacture of flat-bands, and in what

manner the same is to be performed, I wish it to be understood, that I lay no claim to the exclusive use of the die, or of the above-mentioned methods of rivetting, except so far as the same is or may be necessary or useful in the manufacture of flat-bands as herein described. And I hereby declare that what I claim in respect of this my first improvement, is the manufacture of flat-bands by drawing through dies as herein described.

My next improvement in flat-bands, consists in manufacturing them of a combination of narrow bands, or strips of iron or other metal, which bands for some purposes, particularly in deep mines, possess advantages over the flat-bands before described, on account of the greater security against accident or sudden breaking, which such a combination presents. The improved bands now spoken of, are composed of strips of metal arranged side by side, and fastened to cross pieces, as represented in fig. 7; and for this purpose, I use metal drawn through dies as above described, or metal rolled in strips, taking care to select such as are free from flaws, and straight, or if necessary to cut their edges true and parallel, which may be done by circular shears. The pieces of which the flat-band is to be composed, are laid side by side, and kept in a state of equal tension by weights acting over pulleys, while the cross pieces, as at *a*, *a*, fig. 7, are rivetted on and joined at the end by a butt-joint, as at *b*, or by an overlap joint, as at *c*. The cross pieces may be from eighteen inches to five feet apart, the breadth and thickness of the component pieces of the band varying according to circumstances.

And I hereby declare, that what I claim in respect to my last-mentioned improvement is the combining several pieces or strips of metal so as constitute a flat-band, as hereinbefore described.

My third improvement consists in forming a flat-band by weaving narrow strips or wires of metal in a loom, the strips or wires which constitute the warp, being wound

on separate bobbins and kept at a uniform tension during the operation of weaving. It will, in most cases, be advisable to have the wire used as the weft of smaller size than that used as the warp.—In witness whereof, &c.

ROBERT STIRLING NEWALL.

Enrolled May 16, 1842.

Specification of the Patent granted to MOSES POOLE, *of Lincoln's Inn, in the County of Middlesex, for Improvements in Steam-Baths and other Baths.*—Sealed July 13, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—

Description of the Drawing.

Fig. 1, represents the section of a room suitably constructed, and having apparatus combined therewith according to the invention.

Fig. 2, is a plan thereof *a*, represents part of a steam-boiler, which I prefer to be of copper, which is to be fitted with a safety-valve, and also suitable means for keeping up a proper supply of filtered soft water. In this boiler a constant supply of steam, at a pressure of ten pounds to twenty pounds on the square inch, is to be kept up for supplying the bath, and for heating water in a suitable vessel, for producing what I call rain douche-baths, as hereafter explained. *b*, *b*, *b*, *b*, represent a room, the walls or sides and top and bottom of which are to be made steam-tight, which is usually done by lining the same with lead or zinc or other suitable materials, and there is a double glazed window, *z*, for admitting light; and there is to be an opening, *y*, near the floor to admit air freely, having a shutter in order more or less to close it, and to regulate the supply of fresh air into the room, and on the op-

posite side of the room, at the upper part thereof, is another opening, *x*, to allow of the steam and air from the room to pass off, such opening having also a shutter by which it may be more or less closed; by this arrangement the ingress and egress of air may be adjusted to the feelings of the person taking the bath. *c*, *c*, is a wood floor perforated with holes, by which the water used for the rain douche-baths may flow off freely. *d*, is a steam-pipe leading from the steam-boiler to the room; on this steam-pipe are two nozzles, *e*, *e*, with stop-cocks, by which steam is permitted to flow into the room constituting the bath, for it will be understood that the whole room constitutes the chamber in which the bath is taken; thus allowing of the person taking a steam-bath, according to the invention, to sit, stand, walk, or lie, during the time of administering the bath; and the temperature of the bath, owing to the using of steam at considerable pressure in the boiler, will not be above the natural temperature of the blood of the person taking the bath, which is very important. At the same time, I would remark, that I do not claim the simple use of steam generated under pressure, when uncombined with a room or apartment wherein there may be a ventilation of atmospheric-air, and a consequent change of the atmosphere of the room or bath during the act of bathing. On either or both of the pipes, e^1, e^1, may be applied a flexible tube with a suitable nozzle, for directing a strong flow of steam of different temperature and pressure, which is regulated by the cocks on the pipes, e^1, against any part of the person or persons taking the bath. *g*, *h*, are two tanks of water, the tank *g*, containing cold water, which should be pure water obtained in condensing the steam used to heat the water of the vessel, *h*, such vessel, *h*, being kept supplied with filtered soft water, and by means of a steam-pipe and worm, *i*, the water in the vessel, *h*, is kept constantly boiling. *j*, *k*, *l*, are three rose-heads, or they may be douche-nozzles screwed on to the pipes, *m*, *n*, *o*, such pipes

having a communication with each of the tanks or vessels, *g*, *h*; and these three pipes are to allow of the person being subject to a flow of water to three different parts of the person at the same time, which water may be at the same temperature from each pipe, or each differing in temperature, and the jets may have more or less force, according to the size of the perforations of the rose-heads and the opening of the cocks; and these may be regulated according to the feelings of the person taking the bath; for instance, cool to the head, warmer to the stomach, and still warmer to the feet; or only one or two of the pipes may be used, according as may be desired. The pipe, *m*, by the pipe, m^1, is in open connexion with the tank or vessel, *g*, and by the pipe, m^2, the pipe, *m*, is in open connexion with the tank or vessel, *h*; each of the pipes, m^1 and m^2, having cocks, it will be evident that if only the cock on the pipe, m^1, be opened, cold water will flow through the pipe, *m*; and in like manner if only the cock or the pipe, m^2, be opened, the flow of water would be boiling water from the vessel, *h*, through the pipe, *m*. It will, therefore be readily understood, that if both cocks of the pipes, m^1, m^2, be open at the same time, a mixture of the water of the vessels, *g* and *h*, will flow through the pipe, *m*, and, therefore, according as the two cocks, m^1, m^2, are respectively more or less opened, so will be the temperature of the water used, and the temperature of the water as it flows through the pipe, *m*, may be regulated instantaneously, by varying the relative quantities of hot and cold water allowed to flow to the pipe, *m*. And it only need to be observed, that the pipes, *n* and *o*, have a similar arrangement of pipes, n^1, n^2, and o^1, o^2, by which a similar regulation of the temperature of the water may be obtained, whether there be a douche-nozzle on each of the pipes, *m*, *n*, *o*, or a rose-head, as shewn. Although I prefer to prepare the skin by means of the rain douches before the steam-bath, yet such preparation may be performed in an ordinary plunge-bath, *p*. *q* and *r*, are four inclined benches, with thick canvass or bed-tick stretched tightly

over them, in order that the person or persons taking the bath may recline thereon. *s*, is a bench of wood perforated all over with small holes. In administering a steam-bath according to the invention, the person is first subjected to a fine rain douche-bath, from all or any of the pipes, *m*, *n*, *o*, and at any temperature or force which may be felt to be agreeable to the person, and what is considered necessary for the particular case; and such temperature may be varied and made either hotter or colder, as above described. And before taking the steam-bath I prepare the skin by using a rain douche-bath at a comparatively low temperature, gradually increasing, depending on the season and temperature of the atmosphere, and according to the medical directions for the particular case. The person having been thus prepared, high pressure steam is admitted into the room, gradually, by the nozzles, *c*, *e*, and if desired also to a particular part or parts of the person, by means of the flexible tubes on the pipes, e^1, permitting the steam to flow so as to keep the room from 80° to 100° of Fahrenheit, which will readily be done by means of the cocks and the ventilators; and the patient may lie, sit up, stand, or walk, during the time of taking the steam-bath, and it will be found that the room will be light, in addition to the advantage of the bath being at a temperature from 80° to the natural temperature of the blood, which is consequent on using steam at high pressure. The person having remained subject to the steam-bath a time, according to the circumstance of the case and under medical advice, will again be subjected to the rain douche-bath of any or all the pipes, *m*, *n*, *o*, commencing with a temperature agreeable to the feelings of the person, gradually lowering the temperature till the skin is prepared according to the temperature of the external atmosphere; the person will then pass from the bath-room into a dressing-room, and it will be found that owing to the use of comparatively high pressure steam, in a room constructed as above explained, and from the circumstance of having sufficient atmosphere

to breathe freely, during the time of being subject to a high-pressure steam-bath, there will be no feeling of oppression to the chest or head. And it is, as above stated, an important and novel feature of this invention, to use high-pressure steam in a room, wherein the person taking a bath can have a plentiful supply of fresh atmospheric-air in conjunction with the steam, and also the further advantage of having an attendant present to aid the patient, and to regulate the state of the bath according to the feelings of the patient, and, if thought necessary, the patient can have his medical adviser, to observe the effects produced during the bath: and such is the peculiar effects of this bath, that an attendant may continue throughout the day, and from day to day, subject to the bath, with several persons in succession, without prejudice to health; on the contrary, the attendant's health has been found to be improved under such circumstances. And an important improvement constituting part of this invention, is, the combining the use of a previous and subsequent water-bath, with progressive and gradually changing temperatures, with a high-pressure steam-bath in a room under the circumstances above explained. And another improvement, above described, consists in the mode of obtaining any desired temperature and force of douche-baths, which may be used separate from, or conjointly with, the steam-bath, as above described; and when to be used separately the rain douche-apparatus may be made portable in place of being fixed. And it will be evident that, when required for particular cases, the water for the douche-bath may be combined with vegetable, animal, or mineral matters, which, however, forms no part of the invention; and the direction of the douche-pipes may be varied by screwing on other pipes, according as the patient requires to receive such baths in a sitting, standing, or reclining posture.

Having thus described the nature of the invention, and the manner of performing the same, I would have it understood, that I do not confine myself to the precise details, provided the peculiar character of either of the improve-

ments above described be retained; but what I claim, is, first, the mode of producing a steam-bath by the application of steam, (generated under considerable pressure,) within a room so arranged, as to allow of a sufficient circulation of fresh atmospheric air as above explained.

Secondly, I claim the mode of combining the use of a high-pressure steam-bath in a ventilated room, with a rain, douche, or water-bath, whereby the skin is prepared before and after a steam-bath, as above explained; and,

Thirdly, I claim the mode of regulating the temperature of douche-baths, whether rain or voluminous, as above explained.—In witness whereof, &c.

MOSES POOLE.

Enrolled January 13, 1842.

Specification of the Patent granted to WILLIAM BURGE, *of the City and County of Bristol, Sign Painter, for Improvements in Propelling Vessels.*—Sealed December 21, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention consists of a machine to be attached to the side of a vessel, by means of which the floats or propellers are made to enter the water at a curve of small resistance, to act under water in a line parallel to the water's edge, and then to leave the water in a perpendicular direction, as may be seen by the accompanying drawings.

Description of the Drawings.

First, two wheels placed parallel to each other between the side of the vessel and the outer beam of the paddle-box, each having the same dip in the water, the main or working-wheel placed on the main-shaft having a groove in each rim deep enough to imbed vertically a plate-chain, thus forming double rims, the inner one of each having indentures at equal distances opposite each other, to re-

ceive the bars or spindles that are inserted into the chains to carry the floats, the other wheel differing from it in having its inner rims low enough for the bars or spindles to pass over.

Second, two chains, each formed of alternate single and double plates of iron bolted together, and their ends inserted into each other and fastened in the same manner, thus becoming endless chains, are placed over both wheels, one on each side parallel to each other; in each chain is inserted two or more compensating-links.

Third, each compensating-link is formed by placing a single plate, perforated at one end as a single link, between two plates terminating as a single link, at the opposite end; through the three is an oblong opening, (bevelled externally on its upper and lower edges,) whose width is equal to the diameter of one of the link-bolts, and whose length will admit a square bolt with dovetailed ends to fit the bevels, and as many plates or wedges of a similar description as shall compensate for the wear of the chain.

Fourth, the spindles are round bars squared at the ends where they are inserted in the chains, and having a hole in each square to receive a pin between the two plates of the chain to keep them in their places: on these spindles the floats work loose: a loose washer or collar is likewise on the spindle at each end between the float and the chain, to keep the float clear of the wheel.

Fifth, each float consists of two iron plates similar in shape, but one deeper than the other, each hollowed slightly convex its whole length, and about two-thirds its depth, forming a figure whose external edges are bounded by catanarian curves nearly meeting at the ends. These plates are rivetted together all round the convex part, the larger plate overlapping the smaller all along the top and bottom, and welded between the two. At each end is an iron bar with a hole in its centre to receive the spindle (on which it turns): to these bars the ends of the plates are rivetted. A broad iron strap crosses the float in a perpen-

matter from which it is desired to obtain a decoction, in quantity proportioned to the size of the vessel, A, is put into that vessel, through C, then hot or boiling water is poured in till it rises to C, and a strainer of linen or cotton cloth, or other straining material, is fixed on or in C; then the vessel, A, is inverted, as shewn in fig. 2, and, while in this position, the said heater being ready, is dropped into E. The heat thus imparted to the contained liquid, causes steam or vapour to rise towards D, and, by expanding, to expel the liquid in a clear state through the said filtering material at C, the liquid being received into any proper vessel. The size and shape of the vessel, A, may be varied, and materials of which the vessel, A, and tube, E, are made, may be of tin or other suitable material, and the nature of the filtering material employed may be varied.

Having thus described the nature of my invention, and the manner of carrying the same into effect, I would have it understood, that I claim the mode of constructing apparatus to act by being inverted, aided by the application of heat.—In witness whereof, &c.

WILLIAM CHESTERMAN.

Enrolled December 23, 1841.

Specification of the Patent granted to JOHN BURNELL, *the Younger, of High Street, Whitechapel, in the County of Middlesex, Manufacturer, for Improvements in the Manufacture of Leaves or Sheets of Horn, commonly called Lantern-Leaves, and in the Construction of Horn-Lanterns.*—Sealed November 9, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention relates, First, to a mode of preparing or

treating leaves or sheets of horn in order to render them more suitable for transmitting light.

Secondly, my invention relates to an improvement in the manufacture of lantern-leaves or sheets of horn, used for the purposes of transmitting light in horn lanterns, and other glazed surfaces, by causing such lantern-leaves of horn to be coloured or dyed.

And Thirdly, my invention relates to improvements in the means employed in joining or connecting lantern-leaves of horn, and also in constructing the pillars or ribs of horn-lanterns, in order to receive sliding-panes or panels of horn. And in order that my invention may be most fully understood and readily carried into effect, I will proceed to describe the means pursued by me in carrying out my invention. And, first, as to the preparation or treatment of lantern-leaves or sheets, which are to be produced as heretofore; but in place of using them in lanterns in the same state as formerly, by simply polishing the surfaces, I cause them to be varnished on both sides; and I prefer to employ for that purpose copal varnish, and when the varnished surfaces are carefully dried, the lantern-leaves so prepared or treated, will be found much more suitable for transmitting light.

I would remark, that although I prefer copal varnish, yet I do not confine myself thereto, as other transparent varnishes may be used, care being observed that the varnish used will dry well and clear on the horn.

The second part of my invention has for its object to render horn-lanterns more suitable for signals, and making lantern-leaves more useful in transmitting light by applying coloured lantern-leaves, and, for this purpose, having obtained lantern-leaves as heretofore, and of sizes suitable for glazing lanterns and other surfaces, I cause them to be dyed or stained of such colours as may be desired.

And I may here remark, that the staining or dying of horns forms no part of my invention, the same being well known and practised for other purposes, and there-

fore it will not be necessary for me to enter into any description thereof, this part of my invention relating only to the preparing lantern-leaves, used for glazing lanterns and other surfaces, by dyeing or staining, in order to their being used more advantageously in the construction of horn-lanterns and other surfaces, and the leaves may be treated according to the first part of my invention or not; but I prefer that the stained or dyed lantern-leaves should be varnished. And although I do not confine myself to the use of the second part of my invention, to the combining it with the construction of lanterns hereafter explained as the third part of my invention, for other constructions of lanterns may be used with stained horn-leaves, yet I believe the construction of lanterns hereafter explained to be the best, whether for using the lantern-leaves of horn in the state in which it was formerly employed or according to the first and second parts of my invention.

Description of the Drawing.

Fig. 1, represents a horn-lantern constructed according to the third part of my invention.

Fig. 2, is a section thereof.

Fig. 3, is a plan of a lantern without the top or cover.

Fig. 4, is a transverse section.

Fig. 5, shews panels or panes of lantern-leaves, and the modes of fixing the parts of lantern-leaves to form a panel.

Fig. 6, shews the metal of which the ribs or pillars of lanterns are made, in order to allow of the use of sliding-panels.

Fig. 7, shews the bent metal to join or connect two parts of a panel of lantern-leaves.

Fig. 8, shews the candle-holder, which may be varied, or an oil-lamp may be used in lanterns; but these parts form no part of my invention.

The pillars or ribs, *a*, of the lantern shewn in the

drawing, are made by forming tin-plate or other suitable metal into the figure shewn by the section, fig. 6; and the parts *b, b,* allow of the sliding of panels of horn in frames, such as is shewn in the drawing. Each of the panels used, being bound or framed round with metal as is shewn, by this arrangement any of the panels may be taken out to clean or be repaired, and may be returned to its place readily; or, by having various panels of different colours, they may be changed from time to time as circumstances may require.

I will now describe the means of combining two sheets or leaves of lantern-leaves, which consists of bending the thin metal used into the figure shewn in the section, fig. 7, and between the spaces, *c, c,* and then by folding the metal closer together, when two sheets of lantern-leaves are introduced, as is shewn in the drawing. The nature of the other parts being clearly shewn, it will not be necessary to enter into any further description thereof, and I would state, that the details of the parts may be varied.

But what I claim is, First, the preparing or treating the leaves or sheets of horn by varnishing the surfaces thereof.

Secondly, I claim the staining or dyeing lantern-leaves or sheets of horn, used for transmitting light.

And, Thirdly, I claim the mode of constructing the pillars or ribs of horn-lanterns, so as to allow of the use of sliding-panes or panels of lantern-leaves, when such panels or panes are bound round with metal as shewn.

And I also claim the mode of joining two or more lantern-leaves together as above described, in making panels or panes for lanterns.—In witness whereof, &c.

JOHN BURNELL.

Enrolled May 9, 1842.

Specification of the Patent granted to THEODORE FREDERICK STRONG, *of Goswell Street Road, Middlesex, Engineer, for certain Improvements in Locks and Latches.*—Sealed September 28, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—My improvements consist, Firstly, in the combination of a series of two or more tumblers attached to the bolt of a lock and one to another, each tumbler having its fulcrum on the preceding tumbler of the series, near the end opposite to the fulcrum of that preceding tumbler, the first of the series having its fulcrum in the tail-plate or thin part of the sliding-bolt; thus the fulcrum of the tumblers are alternately placed near the opposite ends of the tail-plate, and consequently the alternate tumblers rise the one to the right hand and the other to the left, where the lock is held up in a vertical position, whereby a great complication of checks against the operation of a false key is obtained from a few tumblers.

Secondly, in attaching a secondary-bolt sliding transversely in the main-bolt of a lock, and acting against an abutment, to form a detent in addition to the complicated effect of the alternating-tumblers described as the first part of my improvements; this transverse bolt being to be drawn back by one of the tumblers before the main-bolt can be withdrawn.

Thirdly, in the combination of the alternating-tumblers with a secondary-bolt attached to the lock-plate, and shooting into a notch in the main-bolt to prevent its being drawn back previous to the withdrawal of the bolt.

Fourthly, in adding to the combination of alternating-tumblers, a detecting-tumbler connected with the secondary-bolt above described under the second part of my improvements, which detecting-tumbler on being lifted too high

by a false key is there detained by a spring-catch until released by the true key.

Fifthly, in the combination of a hooked catch-piece, with several tumblers acting on one common fulcrum, the whole of the tumblers constituting a substitute for the bolt, whereby a greater number of tumblers of a given thickness may be introduced into a thin lock than when the catch-piece is pierced through in the manner of a staple.

Sixthly, in the application of a pair of links, one hinged to each side of the sliding-bolt of a spring-latch, each link terminated at the end opposite to the hinge by a hook catching on upon the follower, whereby the followers, whether turning right or left, act with very little friction in withdrawing the bolt.

Seventhly, in the formation of a hinge by casting alone in parts of the lock in which the motion on the joint is but small, for which purpose a notch is cast in one of the pieces of the hinge of the form of about three-fourths of a hollow cylinder, into which notch a cylindrical protuberance or knuckle, cast with the other piece of the hinge, fits and turns in a small arc of a circle, such a hinge being peculiarly applicable to the joining of the links to the sliding-bolt of the spring-latch mentioned under the sixth head of my improvements.

Eighthly and lastly, in the application of a forked connecting-piece between the followers, and a lifting-latch, for the purpose of communicating the motion of the followers to the latch with very little friction. And I hereby further declare, that the manner in which I carry these my said improvements into effect in some principal combinations, are shewn and exemplified by the drawings hereunto annexed, as explained by the following description thereof, reference being had to the figures, letters, and numbers marked in the drawings in correspondence with the figures, letters, and numbers herein contained.

Description of the Drawings. Sheet I.

Fig. 1, represents a front view;

Fig. 2, an edge view; and

Fig. 3, an end view of the outside of a mortice-lock combined with a spiral-latch, such as is usually applied to the doors of good rooms, the lock-bolt being supposed to be withdrawn and the latch-bolt thrown out by its spring.

Fig. 4, a view of the inner works of the lock and latch as seen when the front plate is removed, both bolts being withdrawn.

Fig. 5, a view of the same works in the position as seen when both bolts are thrown out.

Fig. 6, a transverse vertical section, from A to B, of fig. 5.

Fig. 7, a separate front and edge view of the first tumbler of the series, having its fulcrum hole at the right hand, and to work on a stud fixed in the tail of the lock-bolt.

Fig. 8, a separate front and edge view of the second tumbler of the series, having its fulcrum-hole at the left-hand end to work on a stud fixed in the left-hand end of the first tumbler.

Fig. 9, a separate front and edge view of the third tumbler of the series, having its fulcrum-hole at the right-hand end to work on a stud fixed in the right-hand end of the second tumbler.

Fig. 10, a separate front and edge view of the fourth tumbler of the series, having its fulcrum-hole at the left-hand end to work on a stud fixed in the left-hand end of the third tumbler.

Fig. 11, a separate view of the main-bolt of the lock, carrying the transverse-bolt and a stud in which the ends of the springs that return the tumblers are firmly held.

Fig. 12, an edge view; and

Fig. 13, a section, from C to D of fig. 11.

Fig. 14, a front and edge view of the transverse-bolt shewn separately from the main-bolt.

Fig. 15, a separate front view of the latch-bolt and the two hooked links.

Fig. 16, an edge view of the same.

Fig. 17, a front and edge view of one of the links shewn separately from the latch-bolt.

Fig. 18, a separate view of the two followers and the centre-piece with which they turn.

Fig. 19, a side view of the same.

Fig. 20, a view of the frame and back-plate, in which is shewn, by dotted lines, the form and position of the driver of the transverse-bolt and detaining-spring.

Fig. 21, a front and edge view of the driver shewn separately from the lock.

Fig. 22, a side and end view of the key.

It is to be remarked, that the same letters and numbers of reference signify the same parts in all these twenty-two figures. *a*, the frame of the lock. *b*, the back-plate fixed to and forming part of the frame to which plate the works are principally attached. *c*, the front-plate, removable at pleasure, to expose the works to view. *d*, the main-bolt. *e*, the transverse-bolt. *f*, the driver of the transverse-bolt turning on the neck of a screw in the back-plate. *g*, a stud fixed in the driver to act in the crook of the transverse-bolt, and slide it up and down. *h*, a spring attached to the back-frame, having a hook at the free end to fall into a notch in the end of the driver, and hold it in its resting position. *k*, a banking-piece or abutment projecting from the frame, for the transverse-bolt to catch against. *l*, the tumblers. *m*, the fulcrum-hole of the tumbler. *n*, the stud on which the next tumbler of the series acts. *p*, the springs which return the tumblers to their resting places: these springs are made of one plate of gilt steel, having three longitudinal incisions extending the greater part of the length of the plate, dividing it into four parts, each constituting

a separate spring. *q*, a stud fixed in the tail of the main-bolt, in a mortice of which stud the end of the plate constituting the springs, is firmly held. *r*, two studs, each fixed by one end into the back-plate, the other end being steadied by two apertures made in the front-plate; these studs guide the tail of the main-bolt, and serve for abutments or banking-pieces for the tails of the tumblers to act against. *s*, two slots in the tail of the main-bolt, sliding upon the guide-studs, *r*. *t*, the fulcrum-pin on which the first tumbler hangs and turns. *u*, a screw to hold the transverse-bolt in the groove of the main-bolt. *v*, a spring in the transverse-groove of the main-bolt, pressing against the side of the transverse-bolt to keep it from falling by its own weight. *w*, the notch in the side of the tail of the main-bolt, into which the bit of the key enters, to slide the bolt in or out. *x*, the latch-bolt. *y*, a forked-stud fixed in the back-plate, in which the tail of this bolt slides. *z*, a spiral-spring on the body of the latch-bolt, acting against the forked-stud, *y*. 1, a hinge-piece fixed on the tail of the bolt. 2, two connecting-links, each jointed to the hinge-piece, by means of a solid cylinder forming one end of the link, and acting in a notch in the hinge-piece of the figure, of about three-fourths of a cylinder, the other ends of the connecting-links being formed into hooks. 3, the two followers. 4, the centre-piece united with and turning the two followers.

Sheet II.

Fig. 1, represents a back view.

Fig. 2, an edge view; and,

Fig. 3, an end view of a lock to be fastened on against a door.

Fig. 4, a view of the inner works of this lock, as seen when the front-plate is removed, and a secondary-plate remaining, the bolt being shewn as thrown out.

Fig. 5, a view of the inner works, as seen when the secondary-plate is removed, and the bolt withdrawn.

Fig. 6, a transverse vertical section, from E to F of fig. 5.

Fig. 7, front and edge view of the first tumbler in the series, having its fulcrum at the right-hand end, to work on a stud in the right-hand end of the tail of the bolt.

Fig. 8, front and edge view of the second tumbler of the series, having its fulcrum at the left-hand end to work on a stud in the left-hand end of the first tumbler.

Fig. 9, front and edge view of the third tumbler in the series, having its fulcrum at the right-hand end, to work on a stud in the right-hand end of the second tumbler.

Fig. 10, front and edge view of the transverse bolt, shewn separately from the lock.

Fig. 11, front and edge view of the detecting-tumbler, shewn separately from the lock.

Fig. 12, front and edge view of the detecting-tumbler, as attached to and working in the main-bolt of the lock, and connected with the transverse-bolt.

Fig. 13, a section, from G to H of fig. 12, shewing the face of the detecting-spring-hook.

Fig. 14, a front view of the frame of the lock.

Fig. 15, inside view and two edge views of a plate to be screwed on to the door by four screws, and to which plate the frame of the lock is secured by four hooks, projecting from the face of the plate, and catching under four lugs inside the frame of the lock, and there retained by one screw in the end of the frame.

It is further to be remarked, that the same letters of reference signify the same parts in all the figures of sheet 2. *a*, the frame of the lock. *b*, the back-plate. *c*, the plate to be screwed on against the door. *d*, the four hooks of the door-plate, to catch under the lugs of the frame. *e*, the four lugs. *f*, the secondary-plate to keep the works in place. *g*, the main-bolt. *h*, the studs

for guiding the main-bolt, and for banking and abutting the alternating-tumblers. *k*, the alternating-tumblers. *l*, the detecting-tumbler. *m*, the transverse-bolt. *n*, the banking-piece or abutment behind which the transverse-bolt passes after the main-bolt is thrown out. *p*, the fulcrum of the detecting-tumbler. *q*, a stud fixed in and projecting from the face of the detecting-tumbler, to take into the crook at the lower end of the transverse-bolt, and to work that bolt up and down. *r*, the banking-stud for detaining the detecting-tumbler. *s*, a spring-catch to pass over the top of the left-hand end of the detecting-tumbler, if that tumbler should be raised too high by a false key, in which case the lowest recess of the slot in the tail of the tumbler would be forced up above the height at which the tumbler could pass the banking-stud, *r*, the tumbler being there detained by the spring-hook, until released by a backward motion of the true key pressing upon the curved part, *t*. *t*, the curved part of the detecting-tumbler, against which the true key must be pressed, in order to relieve that tumbler after having been raised too high by a false key. *u*, a spring for throwing down the detecting-tumbler when not held up by the spring-catch, *s*. *v*, the screws for fastening the secondary-plate upon the frame. *w*, two lug-plates fixed to the frame of the lock, to which the secondary-plate is screwed. *x*, three springs made of one plate of gilt steel, held in a stud fixed in the tail of the main-bolt.

Sheet III.

Fig. 1, represents a front view.

Fig. 2, an edge view; and,

Fig. 3, an end view of a mortice-lock, containing also a lifting-latch.

Fig. 4, a view of the works, when the front-plate is removed, and the latch lifted, the bolt being withdrawn.

Fig. 5, a view of the same, when the latch is down and the bolt thrown out.

Fig. 6, a transverse vertical section, from I to K of fig. 5.

Fig. 7, two views of an ordinary tumbler shewn separately from the lock, but to be applied upon the tail of the main-bolt, as an example of the combination of the new with the old tumblers.

Fig. 8, two views of the first of the series of the alternating-tumblers, the fulcrum of this being placed upon the same pin as the fulcrum of the ordinary tumblers.

Fig. 9, two views of the second tumbler of the series.

Fig. 10, two views of the third tumbler of the series.

Fig. 11, two views of the main-bolt, shewn separately from the lock.

Fig. 12, two views of the lifting-latch, shewn separately from the lock.

Fig. 13, two views of the forked connecting-piece, shewn separately from the lock.

Fig. 14, two views of the followers, united by a central-piece, shewn separately from the lock.

Fig. 15, an inner view of the frame or case of the lock, with the studs fixed to it.

Fig. 16, two views of the key.

Fig. 17, a front view.

Fig. 18, an edge view; and,

Fig. 19, an end view of a chest-lock, in which several tumblers turning on a common fulcrum are combined to form a substitute for the bolt.

Fig. 20, a front view of the works when the front plate is removed.

Fig. 21, a vertical section, from L to M of fig. 20.

Fig. 22, three views of the catch-piece.

Fig. 23, two views of one of the tumblers, shewn separately from the lock.

It is also to be remarked, that the same letters of reference signify the same parts in all the figs. of sheet 3. *a*, the frame of the mortice-lock. *b*, the back-plate.

c, the front-plate. *d*, the main-bolt. *e*, the studs for guiding the main-bolt, and for banking the alternating-tumblers. *f*, two slots in the tail of the main-tumbler to work over the studs, *e*. *g*, the common-tumbler. *h*, the alternating-tumblers. *k*, the tumbler-springs and stud in which they are fixed. *l*, the fulcrum-pin in the tail of the lock-bolt, on which hang the common-tumbler and the first of the series of alternating-tumblers. *m*, the rising-latch. *n*, the tail of the latch. *p*, the fulcrum-pin on which the rising-latch turns. *q*, a spiral-spring, to return the latch to its place of rest after having been lifted. *r*, the forked-piece hinged to the tail of the latch. *s*, the pair of followers. *t*, the centre-piece, uniting and turning the followers. *u*, the frame of the chest-lock. *v*, the tumblers, terminated at the top by a double hook, the right-hand side to take into the hook of the catch-piece, for the purpose of locking, and the left-hand side to act as a detent to the catch-piece, in case of the tumbler being thrown too far by a false key. *w*, the catch-piece with two hooks, the right-hand hook for the locking, and the left-hook to prevent unlocking whenever a false key turns any one of the tumblers too far, so that all the tumblers must be turned far enough, and not one too far, in order to disengage the catch-piece. *x*, the springs which return the tumblers to their resting place.

These examples of the application of my improvements will be abundantly sufficient to enable any skilful lock-maker to adapt some of them to the construction of each variety of locks for gates, doors, cabinets, cupboards, chests, drawers, book-cases, books, and portfolios, and locks for other purposes; also for padlocks, for which last kind of lock the tumblers and hooks described in fig. 16, and the following figures of sheet 3, are particularly applicable.

And I hereby further declare, that I do not claim as my invention, the various common parts of locks or latches shewn in the drawings, and which were necessarily

introduced as foundations upon which my improvements might be exemplified, such as the frames, the plates, the bolts, the springs, the studs, the screws, the guide-pieces, or the form of the tumblers.

But what I claim is, the alternate position of the fulcrum of a series of two or more tumblers, the first tumbler having its fulcrum on the thin part or tail of the main-bolt, the second tumbler having its fulcrum on the first tumbler, near the moveable end, the third tumbler having its fulcrum on the second tumbler, near its moveable end, and so on to any convenient number of tumblers.

And I claim the combination of the alternating-tumblers with a transverse secondary-bolt acting as a detent to the main-bolt, whether the secondary-bolt be attached to the main-bolt itself or to the lock-plate.

And I claim the combination of the detecting-tumbler with the secondary-bolt.

And I claim the combination of two hooked catch-pieces, with several tumblers acting on one common fulcrum, the tumblers forming together a substitute for the bolt.

And I claim the application of a pair of hooked links, hinged to the sides of a bolt of a spring sliding-latch, the hooks catching on and drawn by the followers.

And I claim the formation of a hinge by a protruberant cylindrical-knuckle acting in a hollow cylindrical-notch.

And I claim the application of the forked piece between the followers and the lifting-latch, the particulars of all these claims being hereinbefore shewn and described.— In witness whereof, &c.

THEODORE FREDERICK STRONG.

Enrolled March 28, 1842.

Specification of the Patent granted to Alphonse Rene le Mire de Normandy, *Doctor of Medicine de Rouen Department, de la Seine, Inferieur France, now residing at No. 8, Red Cross Square, Cripplegate, in the City of London, for certain Improvements in the Manufacture of Soap.*—Sealed September 8, 1841.

To all to whom these presents shall come, &c., &c.—My said invention consists in adding or introducing into soap made or manufactured in the usual way, known to soap manufacturers, certain substances, the effect of which is to render such soaps cheaper, and of such consistency as may be required. The substances just alluded to are the compounds of salts of potash and of soda, in general, but more particularly the sulphates and carbonates of potash and of soda. Each of these substances employed singly or conjointly. The mode of employing these substances consists in introducing into the mass of the soap, while in progress of manfacture, when the saponifying process is complete, and it is ready to be cleansed, the above named substances in the solid state, or in the state of amorphous but pulverized masses, or in the state of crystals, or in the state of crystals melted in their water of crystallisation, or even melted or dissolved in water or steam.

My process or invention and improvements consist in effect, not in the saponifying process, but in treating soaps either in process of making, or when made in the usual way and re-melted, by adding the above named substances, either or any of them, with a view to obtain the results aforesaid, that is to say, hardening or softening, and economy. The doses and substances which I have found to answer best are for 80 lbs. avoirdupois of soap, 28 lbs. of sulphate of soda, and 4 lbs. of carbonate of soda or of

potash; or 2 lbs. of each of the two last mentioned substances. Or if the substances are used singly, then 32 lbs. only of sulphate of soda for 80 lbs. of soap; or 15 lbs. only of sulphate, or of carbonate of potash, for 80 lbs. of soap; or 10 lbs. only of carbonate of soda for 80 lbs. of soap. I would not, however, be understood as giving these doses or proportions strictly, considering that it is the introducing the substances, after or without reference to the process of saponification and for the purposes aforesaid, as well as the forms in which they are exhibited, which constitute the invention, and not the exact proportions in in which they may be used, nor the particular modus operandi, hereafter described.

In order to apply my said invention, the following directions I consider the best to be attended to:—Soap being in process of manufacture in the ordinary way, when the soap-maker judges that it is ready to be taken away from the boiler, in consequence of the process of saponification being complete, and what is technically called turned over into the cleansing copper, I throw into it while in a liquid and hot state for every 80 lbs. avoirdupois of soap, 28 lbs. avoirdupois of sulphate of soda, and 4lbs. avoirdupois of carbonate of soda or of carbonate of potash, or 2 lbs. of each of these two last mentioned substances, in a solid state or in a lump, amorphous state and pulverized, or in the state of crystals or any other proportions of each ingredient, as may suit the purpose of the manufacturer; the soap being harder or softer in proportion as the quantities of carbonate and sulphate of soda or of potash predominate. This being done, you stir, or crutch, or mix the whole together until the mass be quite homogeneous. The soap having been thus treated, is then to be removed from the copper in which the operation has taken place, and is to be poured, as usual, in the frames or reservoirs to cool, and when cold it may be cut into bars, as ordinarily done, for sale. When the sulphate and carbonate of soda or of potash are to be used in a liquid state,

that is to say, dissolved, the following directions should be attended to: Suppose the quantity of soap to be operated upon to be three tons; first of all, if the chrystals are to be dissolved in their own water of crystallization, put into the pot or lower part of the cleansing copper all the quantity of sulphate and of carbonate of soda wanted, in the proportions of 28 lbs. of the first, and 4 lbs. of the second for every 80 lbs. of such soap, and the fire being lighted, let them fall therein into deliquium. When thus melted, transfer from the boiler into that cleansing-copper the whole of the soap, crutching all the materials with it, whilst the soap is in the process of being transferred, until the whole be quite homogeneous. If the crystals or the carbonate of potash are to be dissolved in steam, put also the whole quantity, as just directed, in the pot or lower part of the cleansing-copper, and steam being admitted therein let them be dissolved or liquified by it; after which transfer also from the boiler to that cleansing-copper, the whole of the soap, crutching it with the aforesaid melted sulphates and carbonates, until perfect homogeneity be obtained; or lastly, if the crystals or the carbonate of potash or any part of them are to be dissolved in water, three cwt. of boiling water are to be poured into what is technically termed the pot or lower part of the cleansing-copper, and 2 cwt. of sulphate of soda, and 1 cwt. of carbonate of soda or of potash, or half a hundred weight of each of the two last mentioned substance, are to be thrown into that water. Then the soap being transferred from the boiler into that cleansing-copper, the fire being lighted and the soap thus kept quite hot, the rest of the materials in the proportions before mentioned, that is to say, 21 cwt. more of sulphate of soda, and 3 cwt. more of carbonate of soda or of potash, or 1 cwt. and half a hundred weight of each of the said two last mentioned substances are to be thrown in, and the whole stirred together until perfect homogeneity is obtained.

Instead of introducing my said improvements into soap during the process of its original manufacture, it may in certain cases prove advantageous to operate upon soap already made, and to re-melt it for that purpose. In this state the sulphate and the carbonate of soda or of potash, in the proportions before mentioned, are to be thrown into it, and the whole is to be well stirred together until it is quite homogeneous, then the mass may be taken out and poured into the frames to cool. With respect to the soaps with base of potash, that is soft soaps, the same treatment is to be applied to them, which was described for the soaps with base of soda; that is to say, by introducing into such soaps the same salts separately or conjointly in the solid, pulverized, or liquified state, as described for the other sorts of soap, and in the same proportions, the mode of operating being the same as before mentioned.

Having thus concluded the description of the manner of performing my said improvements, I would observe, that if at any time it should be desirable to alter the character of common soaps, or to reduce an over-dose of my added materials, which may have been given to any soap manufactured on my improved principle, it will only be necessary to re-melt them together in the ordinary way, and reframe them for that purpose. And whereas I claim as my invention only the introducing into soap already manufactured, or in process of manufacture, the salts and compounds of potash and of soda hereinbefore mentioned, independently of, and without reference to, such trifling portions of the said substances as may accidently, perhaps at times be found, as unintentional impurities in the leys, used for the process of saponification, and for the purpose of mixing and incorporating the same with soap in substantial quantities, so as eventually to form a part of the mass itself, whereby I am enabled to give at pleasure what consistency I require to the soap, and to sell

it at a much cheaper rate, without for that purpose deteriorating its quality.—In witness whereof, &c.

ALPHONSE RENE LE MIRE DE NORMANDY.

Enrolled March 8, 1842.

LAW REPORTS OF PATENT CASES.

Common Pleas, Westminster Hall.

Before Lord Chief Justice TINDAL *and a* SPECIAL JURY.

February 11, 1840.

CRANE *v.* PRICE *and* OTHERS*.

Sir F. Pollock.—May it please your lordship. Gentlemen of the jury, I have to state to you the circumstances under which the present action is brought before you, the foundation of the plaintiff's claim, and generally the evidence by which that claim is to be supported. Gentlemen, before I call your attention, and my lord's, to the issues which are joined in the present case, which, presently, I mean to do with some particularity, especially that issue which I observe has already caught my lord's attention (I mean the issue arising out of the fifth plea), it will be necessary for me to give you some general outline of the character and the nature of the plaintiff's invention, in order that you may be better able to appreciate the evidence by which the claims of the plaintiff will be supported. Gentlemen, the plaintiff is a manufacturer of iron, and has been the whole of his life employed in the manufacture of iron by smelting it from the ore. His

* Our readers will perceive that this action was commenced more than two years since; but although we were in possession of full notes of the proceedings, we delayed publishing the report till the trial was finally disposed of. The verdict, which was given for the plaintiff, was merely a nominal one, the whole case depending upon points of law, the Judges' decision upon which was only given on the 13th of June last.—ED.

works are carried on at a place called Ynisceedwyn, the Ynisceedwyn works, not a great way, I think, from some part of the vale of Neath, in South Wales. The defendants are also manufacturers of iron, and their operations are carried on at some works that are called Neath Abbey.

The plaintiff is the discoverer of one of the most important, valuable, and useful discoveries that, perhaps, (as I think I should not use an expression too strong if I said), has shed lustre on modern times, and modern improvements, and modern intelligence and enterprise. And, perhaps, in the whole history of the manufactures of this country, future days will present the name of Mr. Crane on the same level with those persons who have advanced the prosperity of their country in the most eminent degree. Gentlemen, I dare say you are all of you aware, in a general way, of the nature of the smelting of iron. The ore which is dug, taken sometimes from very near the surface, sometimes from the bowels of the earth;—the ore of the iron is first roasted, which reduces it to the state nearly of an oxide of iron mixed with earth. It is then smelted, an operation which consists of exposing it to the action of some carbonic or charcoal principle at a very high temperature. The charcoal unites with the oxygen which makes the metal an oxide; and that restores the metal, or rather brings it into what is called its natural state, or rather its pure state, as the regulus of the metal; and in this state flows down to the lower part of the furnace,—when it is opened it flows away, constituting that sort of iron in its first state called pig-iron, or melted iron, cast iron in the various states in which we find it. Sometimes it flows out at once, to be applied to useful purposes by running into moulds, and is immediately employed for the useful purposes of life. At other times, it flows into the shape of pig-iron, which is afterwards submitted to other processes, in order to bring it into the character of wrought iron. Gentlemen, this was a process, that in former times (as you may readily sup-

pose) was performed chiefly by wood, that is, by charcoal, or charred wood. The volatile parts of the wood were driven off by great heat; charcoal was formed, and then the charcoal and the iron ore were exposed to heat in the furnace, an operation which is called smelting. As far back as the reign of James the First, the woods of this country having been exhausted, it became of great importance to apply (if possible) the immense quantities of fuel that were ascertained to be in various parts of this kingdom, and to apply that fuel instead of charcoal, which by that time had become very dear. The Lord Dudley, whose name I dare say your lordship remembers as constituting an exception to the statute of monopolies, passed in the reign of James the First, under which all patent rights, in modern times, are claimed; it is the only statute that creates that right; and until lately, I believe no Act of Parliament passed to meddle with the subject. In that statute the name of Lord Dudley is excepted from the operations of the statute repealing all past monopolies. Lord Dudley first discovered that iron could be manufactured from pitcoal, or bituminous coal. Now, I do not propose to occupy you in any detail of the process which he adopted. It was chiefly by the application of a blast, in consequence of which he was able to make pit coal applicable to the purposes of manufacturing iron. For many years the process was comparatively imperfect. Iron was made in this country in great abundance: as the process came to be better understood, and the vast powers of the steam-engine were applied to increase the blast that worked the furnaces, greater and greater results followed. For many many years the iron was not so good as the Swedish iron that was made from the abundance of woods in that country, chiefly or altogether from charcoal; but the large supply necessary for many of the ordinary purposes of civil life, the largest supply came from our own works. They have increased in importance; they have at last gradually become a source of great national wealth; and

I dare say you must be apprised, that since the introduction of railroads an impetus has been given to the manufacture of iron, of the greatest importance to the prosperity of the country. Gentlemen, it was discovered that the manufacture could be considerably improved in various ways. The practice of coaking the coal was suggested; that was a great improvement. Some other improvements were introduced, by which it was supposed that for many purposes we had at length got an iron which was equal to Swedish iron. However, some years ago it was ascertained (I may say a great many years ago) that there were large fields—I hardly know how to use a term capacious enough to give you a notion of the immense tracts of country—which in South Wales produce a particular species of coal called stone-coal, or anthracite. The mineralogical name is anthracite; but I propose not to give it that name; but throughout this cause, with the consent of my learned friend, the Solicitor-General, to call it stone-coal, the name by which it was called before the geologists and mineralogists laid hold of it and dubbed it anthracite. This is a substance differing, though called by the name coal; it is a substance that differs very much from the ordinary coal you are accustomed to see blazing in your grates. The common coal, whether it be the best sort that comes from the Wallsend at Newcastle, or whether it be the Staffordshire or the Yorkshire coal, or the cannel coal, is all, more or less, composed of bitumen as well as charcoal; and it has a large portion of earthy matter. Bitumen is that which you see blazing away in a cheerful fire; that is the substance which furnishes gas, which we consume in the streets; and this bituminous coal forms one large class of coal, differing entirely from anthracite, or stone-coal. The stone-coal consists of an exceedingly pure and very compressed, dense, hard, charcoal. The proportion I am now stating very loosely,—it is not very important that I should be very nice in these points; but taking it now that common Newcastle coal

consists of 50 or 60 per cent. of carbon, 20, or 30, or 40 per cent. of bitumen, and the rest earthy matter. The stone-coal has no bitumen whatever; it consists of, perhaps, out of 100 parts, upwards of 90, in the best specimens, will be pure charcoal, a very small quantity of volatile matter, and a very small quantity also of earthy matter; but it is, as nearly as may be, a hard, dense, compact, charcoal. Its appearance, to those who are at all familiar with it, is immediately indicated by its lustre, which is vitreous, and almost metallic; and its structure, which differs from that of common coal; it does not break into those cubes which common coal does; it is remarkably hard, and is, for many purposes of combustion, wholly and entirely useless. If you put it into a common fire—an ordinary kitchen fire, for a considerable time, it will give you an impression that you had put in a large piece of stone, for it would remain dark and cold, apparently not at all attributing to the combustion, but rather impeding the fire. It would at length, if the heat were considerable, itself ignite, and burn very slowly, with no flame, but not at all giving out, under these circumstances, the heat that you might expect from a substance composed almost entirely of charcoal. That charcoal, however, is in an entirely hard state, so compact and dense, that apparently it is intractable under ordinary circumstances; and if you apply it, if you observe its dulness, if you have now got, by great care and artifice, a fire well burnt up, composed chiefly of this coal, if you took a large pair of bellows by way of making it burn much brighter, which of course you would do with any ordinary fire, the result would very much disappoint your expectation, for you would blow it out. Gentlemen, this fuel was known to exist for centuries almost; it was known to be of no use for domestic purposes; it had never been applied to any of the great processes of smelting; attention had been called to it in various ways. It was thought that there must be some mode by which so extensive and

apparently so tempting an article for experiments, so promising a subject for the philosopher, or for the enterprising manufacturer to work upon. You will find that it had been the subject of much consideration, of various attempts, and some patents; it had been the subject of even prizes; rewards were offered for the purpose, to any person who could make use of it, or bring it to bear advantageously in the manufacture of iron. Until the time that Mr. Crane first discovered, that provided you would use a blast previously raised to a temperature of about 600 degrees of Fahrenheit; until Mr. Crane had discovered that which was the subject with him of repeated experiments, and that sort of expense which I dare say you are aware of, when the subject of experiment is a furnace on a very large scale; but having distinctly ascertained the fact, Mr. Crane took out his patent, enrolled his specification, and published to the world that which he had done. Gentlemen, there has probably very rarely been a discovery of this importance and magnitude, the full value of which was instantly appreciated. Within a very short time, the value of all the property around Mr. Crane's premises, and around all the other premises that under his licence have began to work, was greatly advanced in value. I believe, gentlemen, I speak short of the mark, when I say that property became three times the value that it was of before. The iron itself was discovered to be much more abundant in quantity; the same weight of ore gave what they call a larger yield of metal; and the metal that was obtained was itself of a much more valuable quality, on which I shall say a word or two presently; and the process itself was one of considerable economy compared with the other, for a smaller quantity of fuel was actually used. And, gentlemen, these advantages were so clear and acknowledged, so instantly felt in the neighbourhood where Mr. Crane lived, that they did him that honour, which is certainly more frequently done in modern times than it used to be formerly; there

was a very large assemblage of most of the persons connected with the iron trade, who assembled together in honour of Mr. Crane, a meeting of all the influential people in that country, who met together to give Mr. Crane a dinner, and he was undoubtedly then hailed as one of the greatest benefactors to his country that had ever come forward to advance the manufactures, and thereby the prosperity of the country. And the effect of this discovery is, that we shall be able, not merely to compete on the subject of iron of the best sort with any country on the face of the globe, but that we can now, by this process, manufacture a much better iron than any that we have been in the habit of importing for any purpose from any part of the world. I speak chiefly, of course, of Swedish iron, which any one knows, who knows anything of the history of iron, has long been considered, for certain purposes, the best iron; and even at the present time Swedish iron no doubt is used for some purposes, although to a much less extent than was the case few years ago. Gentlemen, Mr. Crane has brought into use—into most efficient use, large tracts of this description of coal, which before his invention undoubtedly was considered to be of little or no use, beyond furnishing fuel to some few manufactories, and the supply that was required for Arnott's stove. It has created a source of wealth wherever stone-coal exists that had no existence before, probably the value of it is more than quadrupled, for instead of being an article of no value, it has become now of a value as great as bituminous coal itself, and for the purposes of this manufacture its tendency is entirely to supersede it,—wherever it can be obtained it would supersedeit. Gentlemen, it is almost as if a person could discover a value—an available and appreciable value for those vast mountains of rock, those vast masses of rock and granite and other things, which you may observe in parts of Scotland and Ireland and the north of England; if you could give to that an appreciable value, how much you

would increase the general importance, and the prosperity of those parts of the kingdom where such articles are to be found! But this is not the only important matter; it gives a larger quantity of iron. That is a matter which is a question of evidence, and will be made out, I believe, to your entire satisfaction. But the iron itself is of far greater value, and if it be required that a discovery should give to the world a new manufacture or substance; the iron that is produced by Mr. Crane's invention undoubtedly has this remarkable feature of novelty, that it is far stronger, far more valuable than any other iron that has yet been made by any other process. Now, gentlemen, I will give you a detail or two on that subject. Gentlemen, the method of measuring the strength of iron, is by taking a bar of a certain length, and suspending a weight from the centre of it, and observing at what weight it breaks short in two pieces; the length of the bar that is used for that purpose is not very important, but the result of the experiments that have been made is this:—that the mean of all the different experiments that have been made with other iron, whether made by the hot-blast or the cold-blast, or in any other way whatever does not exceed 440lbs.; the mean of the experiments made upon a similar bar or bars composed of the stone-coal iron, (or anthracite iron, as it is called), is not less than 600lbs. as compared with 440lbs. And when I have called your attention for a moment to the effect of that statement upon many important matters, I think you will immediately see how much the public must be considered as indebted to Mr. Crane for the discovery that he has made. Gentlemen, when you come to apply the iron thus obtained, in the construction of a chain cable, for instance, the same relative strength is obtained in a cable, as is found in these bars; and when an ordinary chain-cable would not bear a strain of more than 440 lbs., (I put that as a number to indicate the strain upon it) the strain that would be necessary to break a chain-cable made of

anthracite iron must amount to 600 lbs. So also in the construction of all those buildings where recourse is had to iron, on account of its superior strength and its indestructibility by fire. You are, I dare say, aware that large warehouses, manufactories and buildings, public buildings of various sorts, breweries, workhouses, and sometimes even in private houses you have iron as a substitute for timber. Why, in proportion as you get your cast-iron endowed with a property of strength, which, upon looking at the numbers you see makes it about one half more, (it is very nearly that,—the strength is very nearly one half more,) then it immediately follows that the size may be one half less, in order to produce the same strength, and you will have then this iron applicable to a great many purposes, on account of its giving you a strength with a smaller weight and less bulk,—it will be applicable to many purposes, to which the iron manufactured under the old process certainly would not be applicable. In private houses it is almost entirely inapplicable on account of its great weight, and its requiring that the walls should be of a bulk and substance, and strength not usually afforded to private dwellings; but with the character that belongs to this iron, it will become generally useful for many purposes to which iron is not now applicable. Gentlemen, having thus generally described matters connected with the discovery itself, its importance in the improvement of iron, I have now to call your attention to the specification, and the process that Mr. Crane has adopted. Gentlemen, the ordinary mode of smelting iron before this time, had been sometimes by a cold blast, and sometimes by a hot blast; but anthracite has always proved so untractable a sort of fuel, that nobody had ever been able to bring it to bear on the subject, so as to be employed in any degree in the manufacture of iron. Various persons had used a hot blast to pitcoal to coke. An early improvement in the manufacture of iron, from the product of coal, was to substitute coke;

and a hot blast had been applied to that with this disadvantage on the one hand, and, I believe, this advantage on the other; for certainly the manufacture was facilitated by it, but the iron itself was, undoubtedly, much worse; and I believe it will appear (it will be admitted by all persons of any experience on the subject) that the cold blast iron was very much better than the hot blast iron, until Mr. Crane discovered, that by combining anthracite in the smelting of iron as fuel, you get a maximum of advantage that had never been obtained by any other process before. Gentlemen, the patent was taken on the 28th of September, 1836. The specification was enrolled in March, 1837; and I propose now, gentlemen, to read all the material parts of it, in order that you may be as early apprised as possible of the character of the invention as claimed by Mr. Crane himself, and the mode in which he proposes to accomplish the object that he has in view. (The learned counsel after reading the specification,* proceeded as follows:)—Gentlemen, that is the specification, and that is the claim that Mr. Crane makes. He says, I have discovered that which was not known before: that if you will get a hot air blast, and will make that hot air blast come somewhere up to 600 degrees, and you will use the fuel that I point out, and in the manner which I have stated; you will produce a result such as has never been produced; and, gentlemen, I defy any or all the persons who have had the slightest experience in the manufacture of iron, to drive Mr. Crane from this point, that what he has done never was done before; that what he has done is of the utmost value to the manufacture, which he professes to improve; that what he has done, beyond all question has conferred upon the country, in which Mr. Crane resides, a large benefit,—it has given an impulse to the trade; given to the land a value; given to the manufacture of the country an importance that, probably, no single discovery, scarcely in any branch of arts, commerce, or ma-

* For copy of Specification, see *Repertory*, vol. ix., present series.

nufactures, ever did before! I doubt whether any single improvement, even of that gigantic engine, which we refer to continually, the steam-engine, in its immense, I was going to say, but one must not speak of it as omnipotent power, but really, as a boundless power, for we hardly know the limit of that power which we can thus create. I admit, if you take that in all its parts, and as it stands now improved, probably that would be referred to by every one, as the greatest boon that the invention of genius has ever conferred upon civilized man; but, gentlemen, that taken in all its parts has been a work of centuries almost; it has been the gradual accretion of invention after invention and genius continually applied at its utmost stretch to that common object. But I doubt whether any single improvement in respect to that machine can be considered as competing with the vast benefit and advantage which Mr. Crane has conferred on his country. Gentlemen, every fact that I have hitherto stated with respect to the value and importance of the discovery, its entire novelty, that the thing never was done before; that if any person ever dreamt of it, as you will generally find, where an invention is carried completely into success, there will always be persons to start up to say, "Oh, dear, I thought of that before;" or there will be persons to start up and say, "Bless me, you have discovered this, and what a mighty discovery is it? it is what any body could have done as well as you." "Well, then, why did not you do it?" I am quite certain I may rest on your good sense, on your sense of justice, that when you find something new, which is done, and when you find a result so important, so conspicuous, so distinct, so clear, and undoubted, as will be proved to your entire satisfaction, I think you cannot doubt but that the gentlemen who comes forward to claim your protection to-day is entitled to your protection, if he makes out his case. Now, gentlemen, I proceed to a few more details before I call witnesses, in order that the subject may be entirely before

his lordship and you in all the parts of it that relate to the questions hereafter to be submitted to your judgment. Gentlemen, I beg first to call your attention and his lordship's to the pleas. The first plea is the ordinary general issue, not guilty. Gentlemen, I understand that the defendant means to contend here to-day that he has a right to do what he has done, because he does not use all anthracite, but only a considerable part of it. He will say, I admit that I use a hot blast; I admit that I heat it to the temperature that you have described as the proper temperature; I admit that I use anthracite, or stone-coal,—and I use it largely, but I do not use it entirely; and, therefore, he says, I have not infringed upon, or violated, your patent. Gentlemen, I apprehend that is purely a question of fact for you to decide, under my lord's direction. I am not aware that any question of law can arise upon that, beyond what may belong to every question. It is said that the law is but another name for cultivated good sense applied to the ordinary matters of life; and the result is this,—Mr. Crane has discovered, that if you use anthracite, or stone-coal, in the making of iron, you will produce a far better article, and you will use that as fuel that nobody used as fuel before him; Mr. Crane has not necessarily limited himself to the entire use of stone-coal under all possible circumstances in which he may be placed; it is not part of his invention; it is not claimed as such; it is not pointed out as such; but if it were it would make no difference. The question is this,—Mr. Crane having discovered that you can use anthracite, the defendants, Messrs. Price and Fox, say,—Very well, you are able to use stone-coal, as you describe; we will see if we cannot use it too; and they load their furnaces with half a quantity, mixing it half with coke, made from bituminous coal. Is that an infringement of Mr. Crane's process? Why to the extent of one-half it is. What right have you to take a part or share of the benefit and say, to that extent I will take it, and will infringe your patent?

Are you doing that which never was done before, except by Mr. Crane?—Undoubtedly you are. Are you doing it by Mr. Crane's method?—Undoubtedly you are. Then what right have you to do that? I admit that it is not an infringement, perhaps, of the entire patent, but *pro tanto* it is. Now, a different mode of illustrating that would be this:—Suppose a man takes out a patent for the use of a certain kind of sail, and he directs that all the sails of a vessel should be of that construction, would a man have a right to have half of the sails of that construction, and half of the ordinary construction?—I consider that a most distinct violation of the patent to that extent. If a man obtains a patent for an improved wheel and directed that the carriage should be made with four wheels of that description, could a man take two of that construction and two of the ordinary construction, and say, I have not violated your patent at all? The truth is, to any extent that you use anthracite for the purpose of making iron with hot blast,—to any extent that you combine the two, anthracite and hot blast, to make iron, to that extent you do infringe Mr. Crane's patent, if the patent be well founded. Gentlemen, so much I understand is to be said on the other side: "Why, we do not use exclusively stone-coal." Very well, I say, then you do not exclusively violate the patent; but to the extent to which you do use anthracite, if you use it under the circumstances pointed out by Mr. Crane; if you use it with hot blast heated to that temperature to make iron similar to that Mr. Crane has been in the habit of making under his patent, you do use the invention that Mr. Crane made public by his specification, and to that extent I submit you violate his patent, and to that extent I submit you will be answerable in any damages, if it is a question of damages to-day, which it is not. So much for the first plea. The third plea says, after setting out the specification, that the alleged improvement described therein was not, at the time of granting the letters patent, a new manufacture invented by the plaintiff, within the intent

and meaning of the statute. Gentlemen, I am not sure that I precisely know what is the object of that plea. If it be intended that any person before Mr. Crane's discovery had ever made iron by a combination of hot blast with the use of stone-coal, I say, gentlemen, that that is an incorrect statement that cannot be supported by evidence. If it be intended to say, under a sort of special pleading, referring to the statute of monopolies, that there is no new manufacture, for that a process is not a manufacture; gentlemen, that is a question for my lord, and I shall only answer that sort of objection in this way. A process described in this way as producing a result, is, I take it, to be dealt in such manner as to sustain the royal grant and not to get rid of it; and undoubtedly the iron produced is a new manufacture, for I defy my learned friend to say that such iron ever was produced before. But, gentlemen, suppose that the article produced be the same, (which it is not)—suppose the invention to consist in nothing but a process, I believe that for many, many years the Courts have put that construction upon the word "manufacture." It must be a new manufacture; the courts have held that the process is to be considered a manufacture, and if a party obtains a patent for a mere process or mode of doing something, that is as much protected as the production of an entirely new substance not hitherto known. Gentlemen, I did not read the second plea; the second plea says that Mr. Crane is not the first and true inventor. It is hardly worth while to call your attention to that, but my friend, who is with me, having pointed it out I will not omit it. That Mr. Crane is the first inventor of this, I believe to be beyond all possibility of doubt. I presume that plea was put in, in order that we might be called on to prove it, to get some advantage which I do not yet quite understand; but I defy my friend to produce a single witness, who can cast the smallest shade of suspicion upon Mr. Crane's being entirely the original discoverer of this most important operation.

(To be continued.)

SCIENTIFIC MISCELLANEA.

Progress of Foreign Science.

Report of the Commission of the Academy of Sciences upon the Memoir of M. Ebelmen, on his Researches on the Composition and Employment (for manufacturing purposes) of the Gases evolved from Blast Furnaces.

The Commission of the Academy appointed to examine this laborious and important memoir, or, as they say it should more properly be called, " work" of M. Ebelmen consisted of Thenard, Berthier, and Chevreul, by the latter of whom the report is drawn up, and as the subject matter is of high importance, both to the theory and practice of the iron master—as this new method of rendering available the hitherto wasted gaseous combustibles of the iron furnace, has been actually brought into successful operation in Germany; as one or more patents (Yates) have been effected in England for very analogous projects, and as at the late meeting of the British Association, one of the members of the committee of the section of chemistry was appointed to co-operate with Professor Bunsen, of Marbourg, in extending this very important class of experiments; it seems likely that a full account, amounting nearly to a complete translation of the Report of the French Academy, will be an acceptable gift to the English metallurgist at the present time.

" Since the time that a French iron master, M. Aubertot, contrived furnaces proper for being heated by the flame lost in his blast furnaces, *(hauts fourneaux)*, and especially since the year 1814, when M. Berthier drew public attention to all the results that would follow the use of this source of hitherto neglected heat, it is a matter of wonder, how slowly advantage has been taken of these discoveries, so important in France, where the economy of fuel is of such interest. In fact, it is only very recently that the manufacturers of the country appear to have perceived the advantages of the discovery, although frequently urged upon them by engineers and others; but if further arguments are required to enforce its value, they are to be found in the researches brought forth by M. Ebelmen, a young professor in the school of mines, " on the composition and employment of the gases from blast furnaces."

It will be useful to distinguish the different parts composing the capacity or interior of a blast furnace, and the order which the materials follow in re-acting therein. The interior of a blast furnace comprehends four distinct but connected parts, having one common vertical axis. These are, commencing at top—

1. The belly (*cuve.*)

2. The boshes (*étalagles.*)

These two have the form of two truncated cones, united at their bases, but the height of the belly is to that of the boshes as $2\frac{1}{3}$—$3\frac{1}{2}$ to 1.

3. The hearth (*ouvrage.*) The prismatic cavity, the lower parts of which receive the twyres from the blowing machine.

4. The crucible, or bottom of the hearth, (*creuset,*) the cavity situated below the twyres, into which the slags and the cast iron, produced by the reduction of the minerals, fall.

It is by the mouth, (*gueulard,*) or upper opening of the belly, that the fuel is introduced, along with the ore and flux, and it is at the base of the hearth that the current of air is constantly supplied to maintain combustion.

The coal (or charcoal or wood) plays a three-fold part. One portion developes the heat necessary to the fusion of the substances and the production of their chemical re-action; a second portion takes oxygen from the ore and reduces the iron to the metallic state; and lastly, a third portion, by uniting with the reduced iron, brings it to the state of cast iron.

It is hence evident, that in a blast furnace in action there are two currents in motion, one ascending and the other descending; the first, absolutely gaseous, formed originally of atmospheric air deprived of its vapour of water; it consists at its exit of azote, of all the volatile matters which can be disengaged from the ore, the flux or the combustible, and of the products of the combustion itself.

The descending column is formed of solid material at the commencement, and in the end consists of fluid matter, namely, of slags, and of cast iron.

The researches of M. Ebelmen form by extent, a book rather than a memoir; they have three principal points for their object, viz:—

1. To discover by direct experiment the chemical constitution of the ascending or gaseous current throughout its whole course.

2. To establish the theory of the re-actions of blast furnaces, by the co-ordination of ascertained facts, precisely obtained, with those already known, and in particular as to the descending column.

3. To bring forward some results of experiments as to the employment of the gases which are combustible in the ascending current, and on the means of bringing into use, for the metallurgy of iron, of any combustible having a base of carbon and hydrogen.

Of the Chemical Composition of the Ascending Current.

Great obstacles were encountered by M. Ebelmen in obtaining with certainty the gases from the several parts of the furnace; from the twyre to the mouth, they were collected by plunging into the incandescent mass, through the walls of the furnace, a tube through which the gases were drawn out—the tube required to be of a substance suitable to the temperature of the part. Thus in most parts of the furnace a tube of iron sufficed, but at the twyres it was necessary to use one of porcelain, luted and preserved from the intense action of the fire by a double envelope of iron and clay, and even with this, he was unable to collect the gases at this point in exactly the condition in which they existed in the furnace.

This tube (called the aspirator) was always in communication with one filled with pumice stone moistened with sulphuric acid, so as to retain and give a quantitative determination of the weight of vapour of water; but usually the gas was dried and transmitted directly into a mercurial gasometer of 1600 cubic centimetres in capacity. Sometimes it was previously received in a glass vessel, over water covered by a stratum of oil, so as to prevent contact. In both cases the gases perfectly dried, were submitted in a system of glass tubes to a series of operations, by which

1st. It yielded its carbonic acid to potass.

2nd. It suffered combustion with deutoxide of copper, if it contained carbon and hydrogen in a combustible state.

3d. The carbonic acid and water thus produced were collected and determined.

4th. The azote remaining was then determined directly.

Before introducing the gases into the apparatus a current of azote was passed through it to expel all atmospheric air.

Each analysis was made upon a litre and an half (= 91.542 cubic inches English) of gas. The combustion of deutoxide of copper lasted an hour. Hence in every respect the arrangements guaranteed the accuracy of the results.

By these processes, M. Ebelmen has ascertained that the gas of blast furnaces in its greatest state of complexity as to constitution is composed of vapour of water, carbonic acid, carbonic oxide, hydrogen, in a state of purity as to carbon (*non carbouré*), azote, and when wood in the raw state is made use of, (for he speaks of charcoal fuel in the former case,) of acetic acid, oxycarburetted or carburetted hydrogen, all which are absorbed by pumice moistened with sulphuric acid.

The author has made two series of experiments; in one he has examined the gases from the blast furnace of Clerval (Department of

Doubs) wrought with charcoal, and hot blasts at 176 degrees to 190 degrees per cent.; diameter of twyres 0.065 metres; and pressure of blast equal .015 to .018 metres of mercury. The second series are on the blast furnace of Audincourt, (same department,) where charcoal and raw wood mixed are used, with hot blast at 250 degrees per cent., area of twyres, 32 cent. metres square, and pressure of blast .070 to .074 metres of mercury. In the former case the gases at a mean, deprived of free oxigen, had the following constitution:—

Carbonic acid	12.88
Carbonic oxide.	23.51
Hydrogen	5.82
Azote	57.79

The amount of vapour of water, corresponding to 100 volumes of dry gas, varied from 14.38 to 9.42 volumes, accordingly as the gases were taken when the charge rose above or fell below the mouth of the furnace.

The proportions of hydrogen and azote were nearly constant. The sum of the volumes of carbonic acid and carbonic oxide were constant, but their relative proportions varied. The preceding is the gas taken from Clerval at the level of the mouth.

2nd. Gas taken in the interior of the mouth. In analysing gas taken at 1.33—2.67—4.00—5.33 metres from the mouth. It was found that at 1.33 to 2.67 metres the proportion of aqueous vapour diminished rapidly, the other constituents being nearly the same. From 2.67 to 5.67 metres, the proportion of carbonic oxide augments, and those of carbonic acid and hydrogen diminish.

3rd. Gas taken from the interior of the belly.

The composition here is remarkable, both from its constancy, and from the absence of carbonic acid and vapour of water; it is

Carbonic oxide.............	35.01
Hydrogen	1.92
Azote.......	63.07

It is to be remarked that the quantity of oxygen exceeded the amount of atmospheric oxygen due to the azote, of which the amount remains invariably diminished in going from the mouth to below the belly, in the ratio of 10 : 1; hence the ore must have lost oxygen in the belly.

4th. Gas taken below the boshes.

Their constitution is not so constant as that of the preceding; but of this M. Ebelmen has indicated the probable cause. Their mean composition is

Carbonic acid	0.31
Carbonic oxide.....	41.59

Hydrogen	1.42
Azote.	56.68

5th. Gas taken under the tymp plate, or aperture by which the slags escape a little below the twyre.

These were formed of

Carbonic oxide	51.35
Hydrogen	1.25
Azote	47.40

We see that the oxygen of the carbonic oxyde notably exceeds the atmospheric oxygen due to the azote, and that produced by the decomposition of water due to 1.25 of hydrogene. This result is to be again returned to but already *the absence of all carbonic acid may be remarked in the ascending current, taken at a short distance from the twyre.*

6th. Gas taken at the twyres opening.

These gases present nothing but atmospheric air, of which a few per cents have been converted into carbonic acid. After this it is hard not to admit that the oxygen of the atmosphere, carried directly upon the charcoal, produces carbonic acid, but it is important to observe, from the analysis of the gas taken from the tymp, that the carbonic acid is rapidly changed into carbonic oxide, under the influence of excess of carbon, and of the high temperature in the neighbourhood of the twyre, a temperature such that a gun barrel exposed to it is calcined and melted in about one or two minutes, and a porcelain tube melts when not broken by the first access of heat.

Second Series of Experiments.—Examination of the Gases from the Blast Furnace at Audincourt.

This as mentioned is fed with charcoal and raw wood, which represents in heating power the one-third of its volume of charcoal.

The author ascertained first, as to the depth in this furnace at which the wood was converted into charcoal; that wood which remained one hour and three-quarters, at three metres depth from the mouth (in the belly, whose height was eight metres) preserved its own appearance, and the ore mixed with it had not lost its moisture, whilst at one metre lower, i. e. at four metres from the mouth, an exposure of three and a quarter hours reduced the wood to perfect charcoal, and the ore to magnetic oxide.

The analysis of the gases of this furnace accords perfectly with the preceding, save that in the upper half of the belly of the Audincourt furnace, the gases contain nearly twice as much vapour of water, in consequence merely of the use of raw wood, which gets dried in this part of the furnace; lastly, that the gases contain

acetic acid, and oxicarburets or carburets of hydrogen, condensible by sulphuric acid; but it was remarkable that the hydrogen which escaped the condensation of the acid, was free from all carbon; it resembled, then, as to its chemical condition, the gas from a furnace fed exclusively with charcoal. The circumstances of this furnace, rendered the obtaining the gases from the immediate neighbourhood of the twyre, more convenient than in the preceeding case; the author, therefore, was enabled here to observe, in a certain manner, the formation of carbonic acid by the action of the air, preceeding the formation of carbonic oxide; and has convinced himself of the following important fact,—*i. e.* that the oxygen of the air, blown in at a little above the twyre, is found in the carbonic-acid and carbonic oxide produced, so that he may be certain there is no considerable quantity of iron burnt, in this part of the furnace, under the influence of heat and air.

Finally, M. Ebelmen has found that in a cupola of 1.67 metres, in height, worked with coke, the gases taken at 0.1, metre, in depth, from the mouth, consisted of

Carbonic acid............	12.11
Carbonic oxide...........	11.98
Hydrogen...............	0.95
Azote..................	74.96

from which it results, that the column of coke is insufficient to convert all the carbonic-acid into carbonic oxide, and that there is besides, a quantity of oxygen carried up over the iron, which scorifies it,—a result very different from the preceding cases.*

The next part of M. Ebelmen's memoir, relates to the theory of blast furnaces.

To follow easily the modifications of composition, which the ascending gaseous column suffers in the blast furnace, we must take a definite quantity of azote for a term of comparison—say 100 volumes, which are equivalent to 26 volumes of atmospheric oxygen, but as the azote enters by the twyre, represented by 100 volumes, and is still represented by this same number at its escape by the mouth, it is easy in referring to it the composition of each section of the ascending column, to follow the changes which arise in the relative proportion of the constituent gases.

The analyses of M. Ebelmen, demonstrate that the composition of the gaseous column at a determinate height is constant, when-

* The importance of much deeper cupolas than are generally used in our foundries in Britain, is thus forcibly shewn; by deepening them 1 or 1½ diameters more, we should save loss of iron in oxidation, save fuel in burning the carbonic acid brought to the state of carbonic oxide, and melt the iron faster.—R. M.

ever the blast and the experiment of taking out the gases are constant. However, the analysis of the gases cannot give the mean composition of the gaseous section, which is to be found in the hearth, at a few decimetres from the twyres; and here is the place to state the explanation given by M. Ebelmen, of the great proportion of carbonic oxide indicated by analysis in the gases taken from this part of the furnace. According to him the substances which cover the mass of fluid metal in the bottom of the hearth, and which adhere to the sides of the same, contain silicate of iron, in a pasty state, and charcoal; hence there is an incessant reduction of oxide of iron, which gives rise to carbonic oxide, which is drawn out, through the tube of aspiration, along with the other gaseous contents of the column.

Following, then, the transformations of the stratum (*couche*) of air, entering by the twyres, and passing off at the mouth; its oxygen, converted, first, into carbonic acid, is then changed into carbonic oxyde by means of,—*i. e.*, by uniting with, a quantity of charcoal, equal to that of the carbonic acid,—the volume of oxygen is thus doubled. This conversion takes place in a space very close to where the original one, namely, the production of the acid, is produced. At the same time the vapour of water, introduced with the atmospheric air, is reduced to carbonic oxide and pure hydrogen.

If no silicate of iron were produced, if there were not added to the ore that passes through the furnace, slags of difficult reduction, the section arrived at the height of the boshes, would be represented by 100 of azote, 5.25 carbonic oxide, plus as much more of the latter as would be produced by the oxygen of the hygrometric water of the air, plus the hydrogen of this same water.

From the base of the belly to the mouth, the carbonic acid again appears and augments, until we come to the middle of the belly, when the proportion becomes constant, at the same time the amount of carbonic oxide diminishes, because it produces carbonic acid at its own expense; and in the upper region of the lower half of the belly, there takes place no other chemical phenomena than this re-conversion, which producing an augmentation of the oxygen separated from the oxide of iron of the ore, of 12.7 to 17.

The hydrogen augments from the boshes, to within 1.33 meters of the mouth. It is to be understood, that it is in the lower half of the belly, that the water, the carbonic acid, and in a word all the volatile matters of the ore, of the flux, and of the combustibles are disengaged. In taking account, then, of all the matters re-acting in a blast-furnace, M. Ebelmen comes to the following conclusions.

(*To be continued.*)

NOTICE OF EXPIRED PATENTS.

(*Continued from page* 61.)

JOSEPH CLISILD DANIELL, of Lumphey, Stoke, Wiltshire, Clothier, for improvements applicable to the manufacturing and preparing of woollen cloth.—Sealed August 5, 1828.

JOHN LANE HIGGINS, of Oxford Street, London, Gentleman, for improvements on wheel carriages.—Sealed August 11, 1828.—(*For copy of specification, see Repertory, Vol.* 9, *third series, p.* 328.)

WILLIAM MENECKE, of Park Place, Peckham, Surrey, Gentleman, for improvements in preparing materials for and in the making or manufacturing bricks.—August 11, 1828.—(*For account of specification, see Repertory, Vol.* 9, *third series, p.* 22.)

LEWIS ROPER FITZMAURICE, of Jamaica Place, Commercial Road, Master in the Royal Navy, for improvements on ship and other pumps, which improvements are also applicable by certain alterations to turning lathes and other purposes.—Sealed August 11, 1828.—(*For account of specification, see Repertory, Vol.* 8, *third series, p.* 666.)

WILLIAM GRISENTHWAITE, of Nottingham, Esquire, for a new process of making sulphate of magnesia, commonly called Epsom salts.—Sealed August 11, 1828.—(*For account of specification, see Repertory, Vol.* 8, *third series, p.* 534.)

HENRY MAXWELL, of No. 99, Pall Mall, London, Spur Maker, for an improvement in spring spur sockets.—Sealed August 13, 1828.

THOMAS STIRLING, of the Commercial Road, Lambeth, Surrey, for improvements on filtering apparatus.—Sealed August 16, 1828.—(*For account of specification, see Repertory, Vol.* 9, *third series, p.* 143.)

BENJAMIN MATTHEW PAYNE, of the Strand, London, Scale Maker, for improvements on weighing machines.—Sealed August 18, 1828.

EDWARD BARNARD, of Nailsworth, Gloucestershire, Clothier, for improvements in weaving and preparing cloth.—Sealed August 19, 1828.

PHILIP FOXWELL, Clothier, WILLIAM CLARK, Cloth Dresser, and BENJAMIN CLARK, Cloth Dresser, all of Dye House Mill, in the parish of Minchinhampton, Gloucestershire, for improvements on machinery for shearing, cropping, or cutting, and finishing woollen and other cloths, and cassameres.—Sealed August 19, 1828.

WILLIAM SHARP, of Manchester, Spinner, for improvements in machines for spinning or roving of cloth, silk, wool, or other fibrous substances.—Sealed August 19, 1828.

George Stratton, of Frederick Place, Hampstead Road, in the county of Middlesex, Gentleman, for an improvement in warming and ventilating churches, hot-houses, and all other buildings; which improvements may be applied to other purposes.—Sealed August 28, 1828.—(*For copy of specification, see Repertory, vol. 8, third series, p.* 454.)

PATENTS GRANTED FOR SCOTLAND,

From May 25, *to June* 23, 1842.

Joseph Clisild Daniell, of Tiverton Mills, near Bath, for improvements in making and preparing food for cattle.—Sealed May 25, 1842.

Robert Logan, of Blackheath, in the county of Kent, Esquire, for improvements in obtaining and preparing the fibres and other products of the cocoa-nut and its husk.—Sealed May 28, 1842.

Thomas Henry Russell, of Wednesbury, in the county of Stafford, Iron Tube Mannfacturer, and Cornelius Whitehouse, of the same place, for improvements in the manufacture of welded iron tubing.—Sealed May 28, 1842.

Thomas Middleton, of Loman Street, in the borough of Southwark, and county of Surrey, Engineer, for an improved method of preparing vegetable gelatine, or size for paper, and also an improved mode of applying the same in the manufacture of paper. Communicated by a foreigner residing abroad.—Sealed June 6, 1842.

John Railton, of Blackburn, in the county palatine of Lancaster, Machine Maker, for certain improvements in machinery or apparatus for weaving.—Sealed June 6, 1842.

Thomas Hedley, of the town and borough of Newcastle-upon-Tyne, Gentleman, and Cuthbert Rodham, of Gateshead, in the county of Durham, Millwright, for

an improved apparatus for purifying the smoke, gases, and other noxious vapours arising from certain fires, stoves, and furnaces.—Sealed June 7, 1842.

JOHN BURNELL, the younger, of High Street, Whitechapel, in the county of Middlesex, Manufacturer, for improvements in the manufacture of leaves or sheets of horn, commonly called lantern leaves, and in the construction of horn lanterns.—Sealed June 8, 1842.

OTTO ROTTON, of Gracechurch Street, in the city of London, Doctor of Medicine, for certain improvements in machinery or apparatus for spinning cotton, wool, and other fibrous substances. Communicated by a foreigner residing abroad.—Sealed June 14, 1842.

JOHN BOULD, of Ovenden, in the parish of Halifax, in the county of York, Cotton Spinner, for an improvement or improvements in condensing steam-engines.—Sealed June 23, 1842.

JOHN COX, of Gorgie Mills, Edinburgh, Tanner and Glue Manufacturer, for certain improved processes of tanning.—Sealed June 23, 1842.

LIST OF NEW PATENTS.

JOHN HARRISON SCOTT, of Somer's Town, Engineer, for certain improvements in metal pipes, and in the manufacture thereof.—Sealed July 6, 1842.—(*Six months.*)

LADY ANN VAVASOUR, of Melbourne Hall, York, for improvements in machinery for tilling land.—Sealed July 7, 1842.—(*Six months.*)

RICHARD HODGSON, of Montague Place, Gentleman, for improvements in obtaining images on metallic and other surfaces.—Sealed July 7, 1842.—(*Six months.*)

JAMES TIMMINS CHANCE, of Birmingham, Glass Manufacturer, for improvements in the manufacture of glass. —Sealed July 7, 1842.—(*Six months.*)

Charles Augustus Preller, of East Cheap, Merchant, for improvements in machinery for preparing, combing, and drawing wool and goats' hair. Communicated by a foreigner residing abroad.—Sealed July 7, 1842.—(*Six months.*)

George Edmund Donisthorpe, of Bradford, York, Top Manufacturer, for improvements in combing and drawing wool and certain descriptions of hair.—Sealed July 7, 1842.—(*Six months.*)

William Fairbairn, of Manchester, Engineer, for certain improvements in the construction of metal ships, boats, and other vessels, and in the preparation of metal plates to be used therein.—Sealed July 7, 1842.—(*Six months.*)

Joseph Hall, of Cambridge, Agricultural Implement Maker, for certain improvements in machinery for tilling land.—Sealed July 7, 1842—(*Six months.*)

John Perring, of Cecil House, Strand, Hat Manufacturer, for improvements in wood paving.—Sealed July 7, 1842.—(*Six months.*)

John Bird, of Manchester, Machinist, for certain improvements in machinery or apparatus for raising or forcing water and other fluids, which said improvements are also applicable as an engine to be worked by steam, for propelling vessels, and other purposes.—Sealed July 7, 1842.—(*Six months.*)

William Prichard, the Elder, of Burley Mills, Leeds, Manufacturer, for an improved method of consuming or preventing smoke, and in economizing fuel in steam-engines and other furnaces.—Sealed July 7, 1842.—(*Two months.*)

William Revell Vigers, of Russel Square, Esquire, for a mode of keeping the air in confined places, or in a pure or respirable state, to enable persons to remain or work under water and other places without a constant supply of fresh atmospheric air.—Sealed July 7, 1842.—(*Six months.*)

JOHN PETER BOOTH, of the City of Cork, Merchant, for certain improvements in machinery and apparatus for working in mines, which are applicable to raising, lowering, and transporting of heavy bodies, and also affording assistance in promoting a more perfect ventilation of the mine.—Sealed July 9, 1842.—(*Six months.*)

JEAN BAPTISTE FRANCOIS JONANNIN, of Upper Ebury Street, Pimlico, Mechanic, for certain improvements in apparatus for regulating the speed of steam, air, or water-engines. Communicated by a foreigner residing abroad. —Sealed July 9, 1842.—(*Six months.*)

JAMES CRUTCHETT, of William Street, Regent's Park, Engineer, for improvements in manufacturing gas and in apparatus for consuming gas.—Sealed July 12, 1842.—(*Six months.*)

THOMAS DEAKIN, of Sheffield, Merchant, for improvements in the manufacture of parts of harness and saddlery furniture.—Sealed July 12, 1842.—(*Six months.*)

JEAN LEANDRE CLEMENT, of Saint Martin's Lane, Engineer, for improvements in apparatus for ascertaining the temperature of fluids, and also the pressure of steam. —Sealed July 12, 1842.—(*Six months.*)

WILLIAM HENRY STUCKY, of Saint Petersburgh, now of Upper North Place, Esquire, for a pneumatic engine for producing motive power.—Sealed July 12, 1841.—(*Six months.*)

JOSEPH SCHLESINGER, of Birmingham, Manufacturer, for certain improvements in inkstands, and in instruments for filing or holding papers and other articles.—Sealed July 16, 1842.—(*Six months.*)

ROBERT BENTON, of Birmingham, Land Agent, for certain improvements in propelling, retarding, and stopping carriages on rail-roads.—Sealed July 16, 1842.—(*Six months.*)

JOSEPH BARLING, of High Street, Maidstone, Watch Maker, for certain improvements for producing rotary

motion in machinery worked by manual labour.—Sealed July 16, 1842.—(*Six months.*)

JOHN CHATWIN, of Birmingham, Button Manufacturer, for improvements in the manufacture of covered buttons. —Sealed July 16, 1842.—(*Six months.*)

CHARLES ROBERT AYRES, of John Street, Berkeley Square, Architect, for improvements in ornamenting and colouring glass, earthenware, porcelain, and metals.—Sealed July 23, 1842.—(*Six months.*)

JOSEPH PARTRIDGE, of Bowbridge, near Stroud, Gloucester, Dyer, for certain improvements in cleansing wool. —Sealed July 23, 1842.—(*Six months.*)

EUGENE DE VARROC, of Bryanstone Street, Portman Square, Gentleman, for apparatus to be applied to chimneys to prevent their taking fire, and for rendering sweeping of chimneys unnecessary.—Sealed July 23, 1842.—(*Six months.*)

ALEXANDER JOHNSTON, of Hill House, Edinburgh, Esquire, for certain improvements on carriages, which may also be applied to ships, boats, and other purposes, where locomotion is required.—Sealed July 23, 1842.—(*Six months.*)

EDWARD COBBOLD, of Melford, Suffolk, Master of Arts, Clerk, for certain improvements in the means of supporting, sustaining, and propelling human and other bodies on and in the water.—Sealed July 28, 1842.—(*Six months.*)

THE
REPERTORY
OF
PATENT INVENTIONS.

No. CV. NEW SERIES.—SEPTEMBER, 1842.

Specification of the Patent granted to Edward Foard, *of Queen's Head-lane, Islington, Machinist, for an Improved Method or Improved Methods of supplying Fuel to the Fire-places or Grates of Steam-engine Boilers, Brewers' Coppers, and other Furnaces, as well also to the Fire-places employed in Domestic Purposes, and generally to the supplying Fuel to Furnaces or Fire-places in such manner as to consume the Smoke generally produced in such Furnaces or Fire-places.*—Sealed January 16, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention relates to that description of furnaces and fire-places where the fuel is supplied from below upwards; and in order that my invention may be most fully understood and readily carried into effect, I will proceed to describe the drawings hereunto annexed, in which the same letters of reference are used to indicate similar parts.

Description of the Drawings.

Fig. 1, represents a longitudinal section of a steam-

engine boiler furnace, having my invention applied thereto.

Fig. 2, is a plan of the furnace separately.

Fig. 3, is a side view thereof, separately.

Fig. 4, shows an end view of the steam-boiler and furnace; and

Fig. 5, shows a transverse section of the boiler and furnace. *a*, *a*, are the fire-bars; *b*, *b*, is what I call the coking-oven; it consists of a quadrangular chamber placed below the fire-bars, but opening into the furnace, as is shown in the various figures of the drawings. Within this chamber, *b*, *b*, is placed a piston, and which fits the interior of the chamber, but capable of being freely raised and lowered therein, by means of the racks and pinions, *d*, *d*, *e*, *e*, the racks, *d*, being affixed to the under side of the piston, *c*; and the pinions, *e*, are affixed to the shaft or axis, *f*, which turns in bearing, f^1, f^1, as is clearly shown in the drawings. *g*, *g*, are guide rollers of the racks, *d*, and the piston, *c*, is guided up and down by the projecting surfaces, *h*, *h*, within the chamber or coking-oven, *b*, *b*. At the front end of the coking-oven or chamber, *b*, there is applied a door, *i*, through which the fuel is thrown on to the piston, *c*, when the piston is lowered down for a fresh supply of fuel. *j*, is a wheel, having holes similar to the head of a capstan, to receive hand-spikes or bars, *k*. This wheel, *j*, is affixed to the axis or shaft, *f*, and by means of handspikes or bars, *k*, the axis, *f*, is turned round, by which means the piston, *c*, is raised or lowered, and the piston is kept to any height to which it has been raised by the check or catch, f^2, taking into the ratchet-wheel, f^3, affixed on the axis, *f*. *l*, is a sliding plate, or it may be a grating of bars combined, which moves on the upper part of the chamber or coking-oven, as is shown; or other convenient means may be resorted to for producing and closing of an opening into the fire-place or furnace over the chamber or oven. A rack, *m*, is affixed on the under side of the

sliding plate, *l*, and motion is communicated to the sliding plate, *l*, by means of the crank handle, *n*, affixed on the axis or shaft, *o*, such shaft or axis turning in bearings, *p*, as is shown. *q*, is a bevil-toothed wheel affixed on the axis or shaft, *o*. The wheel, *q*, takes into and drives a wheel, *r*, affixed on the short axis, *s*, and on the same axis, *s*, is affixed the toothed wheel, *t*, which takes into the rack, *m*, and by such means the sliding plate, *l*, may be moved over the chamber or coking-oven, or withdrawn therefrom, as occasion may require. Supposing the furnace to have been at work some time, and the piston to have been raised to its highest position, the mode of supplying fresh fuel is as follows:—The sliding plate, *l*, which has been out of use during the time that the previous charge of fuel in the chamber or coking-oven has been progressively raised and supplied into the furnace, is now to be slided over the coking-oven or chamber, and consequently under the burning fuel of the furnace. By this means the burning fuel over the chamber or coking-oven will be supported, and allow of the piston being lowered in order to receive a supply of fuel thereon, which will readily be supplied through the doorway in front of the chamber or coking-oven, as above described.

The chamber or coking-oven being charged, the door is to be closed and fastened, and the piston raised so as to bring the fresh fuel close under the sliding plate, *l*, that plate is then to be withdrawn, and it will remain out of use until the piston has again been raised to its highest position, when it will be again slided in to sustain the burning fuel above the chamber or coking-oven, and thus again allow of the piston descending to have fresh fuel supplied into the coking-oven or chamber, as before described.

I will now proceed to describe another arrangement of furnace, with apparatus for supplying fuel thereto, very similar to that above described, but differing, inasmuch as there being no sliding plate, *l*, but a temporary plate

which acts in place thereof, to sustain the fuel which is above the chamber or coking-oven when the piston has to descend in order to there being a fresh supply of fuel fed into the coking-oven or chamber.

Fig. 6, shows a longitudinal section of a steam-boiler and furnace, with my invention applied thereto.

Fig. 7, is a front end view; and

Fig. 8, is a transverse section of the boiler and furnace. In these figures the same letters are used to indicate the similar parts to those described in the previous drawings, and it will not be necessary again to describe such parts, as their mode of working has been already described. In this arrangement of my invention the sliding plate, *l*, before described, is dispensed with, and the temporary plate, *v*, used in place thereof. *w*, are four springs, or lever stops, or supports, their upper ends passing through openings formed at the sides of the chamber or coking-oven, and such upper ends have at all times a tendency by their springs to remain within the chamber or coking-oven, as will readily be understood on examining the drawings now under description. The door at the front of the chamber or coking-oven is divided into two parts, the smaller part being at the top, and this is to allow of the plate, *v*, being withdrawn when a fresh supply of fuel has been fed into the coking-oven or chamber. In working this arrangement, supposing the fire to have been at work some time, and that the plate, *v*, resting on the piston, *c*, has been raised to its highest position, it will have passed the upper ends of the spring, or lever stops, or supports, and will be supported thereby, there being notches formed in the piston opposite the spring, and stops or supports, so as to allow the spring stops or supports coming under the plate, *v*, so soon as that plate has passed above those stops or supports; the burning fuel will now be supported above the plate, *v*, and the piston may be lowered down in order to admit of a fresh supply of fuel to the chamber or coking-oven through

the door-way in front, as before described. There being a plate, *v*, first placed on the piston, the chamber being charged, the doors are then to be closed, and the piston raised, so as to bring the fresh supply of fuel under the plate, *v*, when the upper part of the door is to be opened, and the upper plate, *v*, drawn out by a hook or other convenient instrument; and in this manner is the furnace to be worked. I have not thought it necessary to show furnaces applied to other than a steam-boiler for a fixed steam-engine, as it is well known that a furnace for locomotive, or for marine steam-engines, and for a brewer's copper, or for other boiling and evaporating vessels, will not materially vary from that shown; indeed, the arrangement of furnaces are so similar one to another, for whatever purpose they may be applied, that a workman capable of constructing a furnace for a particular object will readily apply my invention thereto from the description above given, aided by the drawings annexed.

I will now describe my invention as applied to open fire-places.

Fig. 9, shows a front view of a cooking range, having my invention applied thereto, and the parts are similar to the arrangements shown in figures 1, 2, 3, 4, and 5, being only so modified as to adapt them to this description of fire-place. But I would remark, that if preferred, the plate, *v*, may be used in place of the plate, *l*, which is shown by varying the parts accordingly.

Fig. 10, is a transverse section of fig. 9. The parts employed in applying my invention, as shown in figures 9 and 10, being marked with the same letters of reference as those of figures 1, 2, 3, 4, and 5, the description of those parts before given will be sufficient to describe the nature and use of the parts shown in figures 9 and 10, when aided by a careful examination of those figures, observing the slight variation of the construction of the parts in order to render them suitable for stoves and open fire-places.

Having thus described the nature of my invention, and

the manner in which the same is to be performed, I would remark, that although I have been particular in describing the best means I am acquainted with for carrying out my invention, I do not confine myself to the precise details shown and described, as they may be varied, so long as the peculiar character of my invention be retained; and I am aware that it is not new to supply fuel from below upwards into furnaces and fire-places, by means of a chamber, or piston, or platform working therein, as similar means were described in the specification of a patent granted to John Cutler, of Great Queen-street, Lincoln's-inn-fields, on the 6th day of January, 1815. I do not therefore claim the same, nor do I claim any of the parts above described separately, or except as combined to produce my invention. But what I claim is, first, the application of a door to the chamber or coking-oven, to facilitate the supplying fuel thereto, as above described. Secondly, I claim the mode of supporting the fuel by means of the plate or surface, *l*, when that plate or surface is used in combination with a piston and chamber or oven, such as are herein described: and, Thirdly, I claim the mode of applying a plate, *v*, working within the chamber or coking-oven, as above described. —In witness whereof, &c.

EDWARD FOARD.

Enrolled July 16, 1841.

Specification of the Patent granted to JOHN HALL, *of Breezer's-hill, Ratcliff-highway, in the County of Middlesex, Sugar Refiner, for Improvements in the Construction of Boilers for "generating Steam," and in the "Application of Steam to Mechanical Power."*— Sealed December 9, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.— My invention consists in constructing steam-boilers of two or more parts in such manner that the parts can

readily be separated one from the other, in order to the more readily cleansing of the flues and tubes of such boilers, and in order that my invention may be most fully understood and carried into effect, I will proceed to describe the drawing hereunto annexed, in the various figures of which the same letters are used to indicate similar parts.

Description of the Drawing.

Fig. 1, represents an external side elevation of a boiler constructed according to my invention, such boiler being composed of three separate parts.

Fig. 2, is a plan thereof.

Fig. 3, shows a side section of the boiler, the three parts of which it is composed being separated one from the other.

Fig. 4, shows a plan of the boiler in section with a stourbridge or brick division in the centre of the part B, to guide the draft.

Fig. 5, shows a section of the front of the boiler taken across the line, Z, Z.

Fig. 6, is another section taken across the line, O, O, showing the space opening into the chimney, and

Fig. 7, shows a back view of the front part of the boiler. A, B, C, show the three parts of which the boiler is to be composed. The part, A, consists of a furnace, L, the chimney, K, the water space, J, the steam-chest or space, I, the spiral tube, H, which opens into the water space at the lower end, and such is the case with the other two pipes, G, G, and it will be evident that as these pipes will be full of water when the boiler is at work, such water will be heated by the heat of the vapours passing up the chimney, consequently the water will come into the boiler at a high temperature. The upper part of the tube, H, is connected with the feed head, W, the height of which above the water-line of the boiler will depend on the pressure of steam used as heretofore, and as is well understood. The parts, B, and C, of the

boiler simply consist of water spaces and tubular connexions between the upper and lower water spaces, so as to produce a circulation of the water, and to offer an extended surface to be heated. The part of the boiler, A, is in the drawing represented to be fixed, whilst the parts, B, and C, have each small wheels applied thereto, by means of which the parts, B, and C, of the boiler can be readily separated from each other, and from the part, A, by moving the parts, B, and C, on the rails or guides, D, D. By this arrangement it will be evident that the flues and tubes of the separate parts of the boiler may be readily got at when they require to be cleansed; but if more convenient, any one of the parts, A, B, and C, may be fixed, or all may be made moveable. E, is the steam connecting-pipe between the upper parts of the boilers, A, B, C, and F, is the water communicating-pipe to connect the water spaces of the three parts, A, B, C, of the boiler, as is shown. M, is a left and right-hand screw-bolt, the screws of which work in female screws, N, N, affixed to the parts, A, C, of the boiler, by means of which the parts of the boiler may be drawn closely together or separated. I would, however, remark that other mechanical means may be resorted to for combining the parts of a boiler constructed according to my invention. X, X, X, are manholes for cleansing out the water spaces of the parts of the boiler. It will be evident that a boiler might, in like manner, be made of more parts than three, and combined together, and capable of ready separation; and further, a boiler may be made of only two parts in place of three, having one part or both parts capable of movement and ready separation from the other. I do not, therefore, confine myself to the number of parts shown in the drawing, and I would state, that the details of the construction of each of the parts may be varied, without departing from my invention, so long as the mode of combining two or more parts be retained. I have not thought it necessary to show a safety-valve, or steam-pipe, or guage-cocks, or manholes to the steam-chest, as

a boiler-maker capable of constructing the boiler, will, as a matter of course, apply such parts where most convenient.

Having thus described the nature of my invention, and the manner in which the same is to be performed, I would have it understood that I make no claim to the separate parts of which the boiler above described is composed. But what I claim is, the mode of constructing steam-boilers for generating steam of two or more parts capable of being readily combined, and the parts readily separated one from the other when required, as above described.—In witness whereof, &c.

DISCLAIMER

Entered by the said John Hall with the Clerk of the Patents of England, pursuant to an Act passed in the 5th and 6th year of the reign of his late Majesty King William the Fourth, entitled, "An Act to amend the law touching Letters Patent for Inventions:"—

I, the said John Hall, do declare that since I obtained the said letters patent, I have discovered that the invention which was intended to have been described under that part of the title which is contained in the following words,—"and in the application of steam to mechanical power," is not of such practical utility as would make it desirable to retain it in the said patent, for which reason I am desirous to and do hereby disclaim all that part of the title which is contained in the following words,—"*And in the application of steam to mechanical power.*"—In witness whereof, &c. JOHN HALL.

Enrolled June 9, 1842.

Specification of the Patent granted to JOB CUTLER, *of Birmingham, in the County of Warwick, for Improvements in the Construction of the Tubular Flues of Steam-boilers.*—Sealed November 6, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—

My invention consists, first, of improvements in the construction of welded iron tubes used as flues for steam-boilers; and secondly, consists in constructing the tubular flues of steam-boilers of coated iron tubes: and in order to give the best information in my power, I will proceed to describe the manner in which I construct or weld tubular flues of steam-boilers.

Firstly, I take a strip of rolled or hammered iron or steel of the required length, breadth, and thickness, depending on the diameter and length of tube required, and proceed to convert it into a tube in the following manner,—If for a lap joint-tube, I first bevel or chamfer the two opposite edges, as is well understood. When this is accomplished, I proceed to bend, strip, or narrow a sheet of iron into a cylindrical shape, by bringing the edges together or nearly so as heretofore practised when making wrought-iron welded-tubes. When the tubes are thus far prepared, they are to be placed in a furnace so as to bring the two edges to a good welding heat. And when in this state, the tubes, having a mandril between each of them, are to be drawn through dies or between grooved rollers. At the mouth of the furnace I place the end of a draw-bench; upon this bench I place two stops; against these stops, a die or dies, or a pair of groove-rolls of the required size for the tube about to be welded. A mandril made in the form of that shown at figure 1, is then placed upon the draw-bench, as is shown; one end is to be made secure at the back end of the bench, the other end of the mandril is to be passed through the die or groove of the rolls, a ring of iron or steel is to be placed into the end of the tube, and capable of sliding over the stem of the mandril or triblet (see figure 2). When these instruments are provided, and the iron or steel scalp or tube is at a welding heat, the mandril is to be pushed through the die and inserted sufficiently far into the scalp or tube to allow the end, which was previously made smaller, being passed through the die or

groove of the rolls*; the steel-ring is then to be forced inside the scalp, the pliers should then take hold of that part of the scalp or tube in which the ring is inserted; the chain being then attached to the plyers should be set in motion, when the hot scalp or tube will be drawn along the mandril through the die or dies, or through the groove of the rolls, the compression on the outer surface of the edges of the hot scalp or tube, and the resistance of the mandril within, will have the effect of welding the joint more firmly and substantially than is now done, by only compressing the external surface of the scalp or tube without any resistance being within. The iron or steel I should prefer for welding into tubes upon this principle would not be stronger than 11-wire guage, but often thinner, but I do not confine myself to the thickness of the iron or steel. The mandril should be made taper for some inches, but that part which is in the die or dies, or in the groove of the rolls where the final welding of the tube is effected, should be the size that is necessary to ensure a good cementation, incorporation, or weld, and to leave the inside perfectly smooth. I do not confine myself to any particular form in the mandril or triblet, but have found the one described to answer my purpose. I prefer that the die or dies should be about ten or twelve inches through, and bell-mouthed at the entrance at the end next the fire, and very slightly conical throughout. A butt joint-tube can be made by this means, and upon this principle. In doing so, however, the two edges of the scalp should stand up a little, or should be bent or prepared a little more egg-shape in section for the purpose of welding. After the welding is accomplished, I draw the tubes through a hole in similar dies, either in a hot or cold state, upon a mandril or triblet, for the purpose of equaling the thickness of the tube throughout, and for smoothing both the inside and the outside of the tube, and for closing the pores of the metal and laying the grain all one way. This will have the effect of increasing

the consistency and durability of the tube, and will be found most advantageous in making tubular flues of steam-boilers. The shape of the die or dies, and the means of opening and closing them may be varied; and such as are now commonly used in making what are known as Russell's tubes may be used. This part of the invention not depending on the construction of the dies, but in the mode of using them in conjunction with a mandril, and means of drawing-tubes to weld them through such dies and over mandrils as above explained. If a welded iron or steel tube, made according to the above-described process, or by other means of welding, is thicker than I require for making tubular flues for steam-boilers, I heat it in a furnace and insert a mandril inside the tube, and proceed to pass it through a pair of groove rolls, rolling the hot tube off the mandril in the same manner as described by Henry Osborn, in his patent for welding gun-barrels, dated 1st May, 1817; or I draw them through a hole or dies when on a mandril or triblet in the same manner as I have described above for the welding of iron or steel tubes. If drawn on a mandril as above described, there will be no difficulty in extracting the mandril, as the stem is of smaller diameter than the mandril, and therefore the tube can be slided off. For the purpose of still further improving the iron or steel tubes, I would place them in a trough and cover them with a solution of two parts of muriatic acid and three parts of water. After they have remained a sufficient time I take them out, and scour them with some gritty substance to clean them from any oxide that may remain. I then wash them free from the acid, and grease them well inside with any oily or greasy matter, and if mixed with a little powdered black-lead it will be better. I then insert a mandril or triblet, and draw them through a hole or bed as before described. This has a very beneficial effect, inasmuch as it hardens the metal, renders both the inside and outside of the tube perfectly smooth and

uniform, equalizes the thickness throughout, closes up the pores, lays the grain all one way, and renders it more durable, and otherwise more suitable for making tubular flues of steam-boilers. It should be remarked that when grooved rollers are used to weld in place of dies, that the rollers are not driven by machinery, but simply revolve by the draft of the tube being drawn between them. Another method of producing welded iron tubes according to my invention is as follows:—The end of the draw-bench and also close to the end of the furnace I fix on the bench an anvil having a groove or not, but I prefer having a groove (and made bell-mouthed at the end next to the furnace), of near three-fourths of a circle upon its face. This must be regulated to the sized tube about to be welded. I then have hammers so placed that their faces shall be brought to bear upon the tube or pipe about to be welded as it is drawn through the groove of the swage or anvil and over a mandril. These hammers I have worked by machinery very fast, so that a continual succession of blows shall fall upon the iron or steel tube as it keeps progressing over the mandril. The faces of these hammers may vary in size and form, and may be made a little hollow on their faces or flat a few inches from the swage or anvil. Lower down the bench are to be placed two stops for dies or a pair of groove rolls. A mandril or triblet is then passed through the dies, or between the groove of the rolls, until its tapered end reaches to the mouth of the furnace, when it is inserted into the ends of the heated tube which is about to be drawn out and welded, the other end of the rod of the mandril being firmly secured at the back end of the bench. The end of the hot scalp or tube is then brought on to the mandril through the groove in the anvil, and through the dies, or between the groove of the rolls, when the ring is inserted inside the scalp or tube, and the pliers attached to the chain belonging to the draw-bench are to take hold of the ends of the tube or pipe at that part

where the ferule or ring (which is made to slide over the stem of the mandril or triblet), is inserted. The bench and hammers are then set in motion, as the chain and pliers continue to draw the tube over the mandril or triblet, which is stationary inside the tube or pipe, and made to bear on that part; when the hammers are continually striking, causes a resistance inside the tube or pipe to the blows given on the outer surface of the tube or pipe for the purpose of welding the two edges together. This process will not produce a good shape of tube, but by the tube passing through dies or between grooved rolls while in a hot state, with a mandril within the tube. And this may be done either while the hammering process is going forwards or afterwards, and such means will have the effect of bringing the tube or pipe into a circular or cylindrical form externally, and the mandril will have the effect of equalizing the thickness of the iron or steel throughout. I cause the welding to be effected by means of the hammers, and the metal to be smoothed both inside and out, to be equalized throughout by means of the dies or grooved rolls, and also to bring them into a perfectly cylindrical form.

I wish it to be understood, in respect to these parts of my invention, that I do not claim the welding of iron or steel tubes by means of hammers worked by machinery, nor do I claim their being welded upon a mandril.

I will now describe another part of my invention. I take a strip of rolled or hammered iron or steel, of the required length, breadth, and thickness, and by any of the known methods convert it into a tube. I then secure the two edges, by either brazing them or by welding them together. I then take a tube made of copper, brass, or other metals, or alloys of metals, and draw it upon the outer surface of the iron or steel tube. I then pass them through a hole or dies by means of a draw-bench, or this may be done by means of grooved rolls, either upon a mandril or without a mandril. They must be then either

drawn or rolled until they are reduced to the required sizes and thickness, which process is well understood by tube-makers.

I also take the iron or steel tube when prepared as above described, but without being soldered or brazed, and proceed to cover it in like manner with copper, brass, or other suitable alloy of metals.

I also proceed to cover or coat a welded iron or steel tube with copper, brass, or other alloys of copper, in manner as before described. I would remark, that I do not claim the making of coated tubes above described this part of my invention relating to the application of coated tubes in constructing the tubular flues of steam-boilers.

What I claim as the first part of my invention is the mode of welding iron or steel tubes by drawing them through dies, or between grooved rolls, when and at the same time as drawing such tubes on mandrils, the mandril being a necessary and important part of the mechanical apparatus in producing the welding.

Secondly, I claim the welding of iron or steel tubes by hammering upon a mandril at the same time I am drawing the tube from the fire along a mandril, so that the tube is welded on and drawn over a mandril at one process.

Thirdly, I claim the application of either iron or steel tubes when coated with copper, brass, or other alloys of copper, in the construction of tubular flues for steam-boilers.

And, Fourthly, I claim in the construction of tubular flues of steam-boilers, the application of welded iron or steel tubes which have been drawn through a circular hole or die, or between rollers, and which have been drawn over a mandr tor the purpose of smoothing the external and internal surfaces of the tubes, and for regulating the thickness of the metal.—In witness whereof, &c. JOB CUTLER.

Enrolled May 6, 1842.

Specification of the Patent granted to JAMES STEWART, *of Osnaburgh-street, Regent's Park, in the County of Middlesex, Pianoforte-maker, for an Improvement in the Construction of Castors.*—Sealed December 16, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—I declare the nature of my said invention to consist in the construction of a castor for furniture, which from the peculiar combination and arrangement of its parts, possesses a greater degree of strength, stability, and freedom of motion, than has hitherto been attained; and I do further declare the nature of the said invention, and in what manner the same is to be performed, to be fully described and ascertained in and by the following statement, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon (that is to say):—

Description of the Drawing.

Fig. 1, represents a section of a socket castor, constructed according to my invention.

Fig. 2, shows a front view of the same castor.

Fig. 3, shows a side view of the same castor.

Fig. 4, shows a section of a plate castor constructed according to my invention; and

Fig. 5, shows a side view of the same castor. The nature of the parts used in each of these castors will be the same, with the exception of the socket and the plate, *a, a*, by which the castor is affixed to the furniture. I shall therefore mark the parts in both castors with the same letters of reference, and in my description I shall only speak of one castor. *a, a*, is the socket or plate by which the castor is to be affixed to the piece of furniture. On this socket or plate, *a, a*, is affixed or cast a tube, *b*, closed at the upper end, so as to afford a good bearing, *c*,

at some distance from the plate or socket, *a, a.* It is well known to be desirable to have the bearing, *c*, for the upper end of the spindle or axis, *d*, of the horns, *e, e*, as high up as conveniently can be obtained, and for such purpose the tube or support, *b*, of the bearing, *c*, may be longer or shorter, according to the nature of the piece of furniture to which the castor is to be applied, depending on the length of tube or support, *b*, which can be conveniently let into the piece of furniture to which the castor is to be affixed. *f*, is a screw to retain the spindle or axis, *d*, in its place. On the lower end of the axis or spindle, *d*, the horns, *e, e*, are affixed as firmly and securely as possible, so as to cause the spindle and horns to work as if constituting one solid piece, *f*, being the roller of the castor, the axis, *i*, of which is carried by the horns, *e, e*, as shown, and as is well understood. *h*, is a friction roller which works against the under surface of the plate, *a*, or of the socket, *a*, as shown. *k*, is the axis of that roller. This friction roller is placed so that its central circular section shall lie between the spindle, *d*, and the plane passing through the central line of the axis, *i*, of the roller, *f*, and parallel to the said central section. The relative position of these parts is shown by the dotted lines, 1, 2, 3, in fig. 4. The consequence of which is, that full effect may be given to the leverage of the horns, *e, e*, and great freedom of motion to the spindle. The friction roller is also placed so that the central line of its axis, *k*, the central line of the spindle, *d*, and the central circular section of the roller, *f*, shall all lie in the same plane, the consequence of which is the attaining great stability and strength, the spindle, *d*, being prevented from bending or yielding to the strains of heavy weights.

Having now described the nature of my invention, and in what manner the same is to be performed, I wish it to be understood that I do not claim as of my invention any of the separate parts hereinbefore mentioned or referred to, being aware that castors have before been made having

a spindle or axis, *d*, working in a bearing, *c*, and that castors have also been made with horns, carrying friction rollers working under the plate or socket, *a*, but in such cases the axis, *i*, of the roller, *g*, has been placed in a plane between the axis or spindle, *d*, and the friction roller,—the friction roller or some part of it being out beyond the axis, *g*; thus necessarily bringing the roller, *g*, of a castor too much under the socket or plate, *a*, thereby losing much of the advantages of the leverage obtained by longer horns, *e*, *e*, when moving the piece of furniture to which such castors may be applied in varied directions: whereas it will be found, that by placing the friction roller, *h*, intermediate between the spindle, *d*, and the axis, *i*, of the roller, *g*, a much greater length of horns, *e*, *e*, with great strength of castor, may be obtained. But what I claim as of my invention is the particular combination hereinbefore described of the spindle, *d*, the horns, *e*, *e*, and the friction roller, *h*, intermediate in its position between the spindle and the axis of the ground roller, in the construction of a castor for furniture.—In witness whereof, &c.

JAMES STEWART.

Enrolled June 16, 1842.

Specification of the Patent granted to OWEN WILLIAMS, *of Basing-lane, London, Engineer, for Improvements in Propelling Vessels.*—Sealed August 4, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—I do hereby declare that the nature of my said invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following statement thereof, reference being had to the drawings

hereunto annexed, and to the figures and letters marked thereon (that is to say):—

Description of the Drawing marked A.

Fig. 1, represents part of a section of a steam-boat, having propellers applied thereto according to the first part of my invention.

Fig. 2, represents a side view of the same parts. *a*, is part of the main or driving-shaft, turning in bearings, *b*, *b*, there being two cranks, *c*, formed thereon, to give motion to the two propellers, *d*, *d*; these two propellers are affixed to rods, *e*, *e*, which pass through guides, *f*, *f*, and slide freely through those guides. The guides, *f*, *f*, turn in bearings in order to allow of the rods, *e*, *e*, assuming the various angular positions caused by the revolution of the cranks, *c*, *c*, the rods, *e*, being connected to the cranks, *c*, *c*, as is shown; and it will be seen that each rod, *e*, moves on and through its guide—the guide acting as a fulcrum to a sliding lever; and it will be evident that the angle of the propellers entering and leaving the water may be varied by a change in the lengths of the cranks, or by varying the position of the guides, *f*. In applying this arrangement of propellers to vessels, I usually place two on each side of the same vessel; but that number may be varied. What I claim as the first part of my invention is the mode of combining the parts, *c*, *f*, *e*, *d*, as above described.

I will now proceed to describe the second part of my invention.

Description of the Drawing marked B.

Fig. 1, represents the stern of a vessel having this part of my invention applied thereto.

Fig. 2, represents part of a side view of the vessel and machinery. This part of my invention has for its object the application of machinery to vessels, in order to take advantage of the rolling and pitching motion of a vessel

and of the motion of the waves, in order to obtain power to propel a vessel. *a*, *a*, represent two surfaces which are connected by pin-joints to the rods, *b*, *b*, such rods being retained to move vertically by the parallel rods, *c*, *c*. The rods, *b*, *b*, pass into the vessel, and are caused to work pumps, as is shown, in order to raise water and force it through openings below the water line of the vessel, and by such means to propel the vessel; or the rods, *b*, may be caused to put paddle-wheels or other propellers into motion, by introducing any suitable gearing or connecting machinery between the propellers and the rods, *b*. This part of my invention simply relating to the means of obtaining power to propel a vessel, it will not be necessary to show how that power is to be applied. And I would remark, that although I have shown the acting or floating surfaces, *a*, *a*, as being below the water, there may be floating surfaces placed on the surface of the water, in connexion with suitable mechanism, for driving propelling machinery, such surfaces when placed in the water being buoyant. And although I have shown the improvement as applied to the stern of the vessel, the same may be applied to other convenient parts.

What I claim as the second part of my invention is the mode of propelling vessels by obtaining power by the motion of a vessel, and by the motion of the waves.—In witness whereof, &c.

OWEN WILLIAMS.

Enrolled February 4, 1842.

Specification of the Patent granted to JOSIAH TAYLOR, *of Birmingham, in the County of Warwick, Brass Founder, for Improvements in the Construction of Lamps.*—Sealed December 9, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—

My invention relates to the construction of lamps used for burning fatty matters and wax, which are not in a liquid state in the ordinary temperatures of the atmosphere of England; and my invention relates to so constructing of such lamps as to receive hot water, or pieces of metal of a cylindrical shape, or solid bars of various sizes, to melt the fatty matters employed; and in order that my invention may be most fully understood and readily carried into effect, I will proceed to describe the drawing hereunto annexed, in the various figures of which the same letters of reference are used to indicate similar parts.

Description of the Drawing.

Fig. 1, shows the upper part of a table lamp.

Fig. 2, is a section of the same lamp.

Fig. 3, shows a plan of the frame for supporting the glass shade.

Fig. 4, is a side view of the frame.

Fig. 5, shows a plan and side view of the tube for turning and raising the wick-holder, and within which the wick is placed. I have not thought it necessary to show the pillar on to which the lamp shown in the drawing is to be applied; but it should be observed, that whatever be the character of the stand or pillar, that there is to be a provision for the passage of air to the interior of the flame. *a, a,* shows the vessel of the lamp which is to contain the fatty matter, or it may be wax, which is to be burned. The shape of the vessel, *a, a,* is clearly shown in the drawing; but the invention is not confined to a particular shape of the vessel, *a, a,* so long as it can have the material placed therein melted by means of hot water, or pieces of metal so constructed as to apply heat when introduced into another vessel in combination with the vessel, *a, a.* Below the vessel, *a, a,* is applied the vessel, *b, b,* as is shown; and this vessel, *b, b,* is to receive hot water or hot pieces of metal, supported by a frame, as

shown in the drawing. Just before lighting the lamp the hot water being introduced through the opening, *c*, and the metal introduced by taking off the upper part of the lamp containing the fatty matter. The lamp in other respects is similar to lamps used for burning oil which is liquid at the ordinary temperatures of the atmosphere of England; and, in fact, oil may be burned in such lamps when there is no supply of fatty matters or wax. *d*, is a tube which conveys air to the interior of the lamp, there being two projections, *e*, *e*, at the upper end, which becoming heated by the flame of the lamp, the tube, *d*, conducts the heat and continues to keep the tallow or other fatty matter liquid during the time of using the lamp; but in case these projections are not sufficient to keep off the heat in very cold climates, I use a circular bar of metal which passes through the flame, and which is shown in the drawing; the hot water or metal being simply to melt the matter in the vessel, *a*, *a*, in the first instance. *f*, is a tube having several slits formed therein, as shown at f^1, f^1. Through these slits the liquid tallow or other matter flows to the wick which is placed within the tube, *f*. And there is also another slit, f^2, formed in the tube, *f*, in order to raise the wick-holder, *g*, such wick-holder being of the ordinary construction, it having a projecting stud, *h*, which moves up and down in the slit, f^2, of the tube, *f*; and it has also a stud, *i*, which moves in the spiral groove formed around the tube, *d*. Hence, when the tube, *f*, is turned round, the cotton or wick will rise or fall according to the direction in which the tube, *f*, is turned. On the upper part of the tube, *f*, are affixed three projections, *j*, *j*, against one of which one of the arms, *k*, of the frame, *k*, of the glass shade comes, and when that frame, *k*, is moved round, the tube, *f*, will also be moved round, and thus will the wick be raised or lowered. *l*, is the gallery for the glass chimney, *m*, and it will be seen that the glass chimney has a flange at its lower end, and it is securely affixed to the gallery by the

screw ring, *n*, as is shown. In using the description of lamp, the tallow or other fatty matter used should be melted and poured into the vessel, *a*, *a*, of the lamp, at the opening, a^1. The lamp may then be put away till it is required for use; indeed, the proper time for supplying the lamp will be after the servant has cleaned it in the morning, and when the lamp is required for use. In the evening, hot water or pieces of heated metal, as described, must be applied.

Having thus described the nature of my invention, I would remark, that I do not confine myself to the shape of the vessels, *a*, and, *b*, nor of the other parts of the lamp shown and described, as they may be varied; and I make no claim to the separate parts of which the lamp is composed, other than the projections in the spiral for the conducting of heat. But what I claim is the mode of constructing lamps for burning tallow or other fatty matters, or wax, by combining with the vessel, *a*, a vessel, *b*, to receive hot water or heated pieces of metal, as above described.—In witness whereof, &c.

JOSIAH TAYLOR.

Enrolled June 9, 1842.

Specification of the Patent granted to JONATHAN GUY DASHWOOD, *of Ryde, in the Isle of Wight, in the County of Hampshire, Plumber, for Improvements in the Construction of Cocks and Taps.*—Sealed December, 9, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c. The method I propose is to form a boss or shank, as shown at *a*, *a*, *a*, *a*, in figs. 1, 2, and 3, or in any other similar shape, with a projecting ring or rim, *b*, *b*, cast on or fastened to the interior of the boss, as shown at *b*, *b*,

and a thread at *c*, cut within the boss to receive the pipe *d*, *d*. This pipe has an exterior thread, and is to be screwed into the boss, *a*, *a*, *a*, *a*, and to carry before it a collar of leather, or wood, or any other similar kind of stuffing. This collar is to be screwed tight to the projecting ring, *b*, *b*, to prevent the fluid escaping between the threads, as also to form a seating for a valve, *e*, *e*. This valve is fixed to the tube or part of a tube, *f*, *f*, which tube is made to fit within the pipe or tube, *d*, *d*, and has an opening or openings, *g*, *g*, *g*, under and near the valve, *e*, *e*. These openings will allow the fluid to pass through them every time the valve and tube is raised. An inclined slot, *h*, *h*, to be cut through the pipe *d*, *d*, for the purpose of passing a pin or handle through, which pin or handle is to be fixed to the inside tube, as shown in the drawings, or in any other similar way. Now, by turning the handle to the left so as to trace or follow the inclined opening upwards, as shown at *h*, *h*, fig. 1, it is evident that it will cause the inside tube and valve fixed to it to be raised at one and the same time, and will then allow the fluid to pass under the valve and through the openings into the inside tube, and will then be discharged at the end of that tube, or through any other openings in it made for that purpose.

Description of the Drawings.

Fig. 1, represents hot and cold water and steam-cock suitable for railway engines or kitchen-boiler, showing the nut and screw to fasten it through the boiler-plate.

Fig. 2, represents a section of No. 1, without the nut and screw, suitable for heavy pressure of water or steam.

Fig. 3, represents the same principle as figs. 1, and 2, but of a different shape.

Figs. 4, and 5, represent a section of two tubes, as shown in figs. 1, and 2.

Figs. 6, and 7, represent an exterior view of the same tubes, showing the inclined slot, *h*, *h*, in fig. 7.

Fig. 8, represents a section of a gauge-cock for marine engine-boilers, showing a part of the boiler-plate, *i, i.*

Figs. 9, and 10, represent a section and exterior view of inside tube of fig. 8, showing two grooves for stuffing.

Fig. 11, represents a section of a lock butt-cock.

I do not claim as my invention any one part separately, but what I do claim is a combination of such parts as have never before been used, as shown in the drawings and described in the Specification, that is to say, the fixing a valve upon a tube or part of a tube, and causing the valve and tube to rise and fall at one and the same time, so as to allow the fluid to pass under the valve and then through the openings into the inside tube, as already described. I do not confine myself to the exterior shape, as that may be varied to suit convenience.—In witness whereof, &c.

JONATHAN GUY DASHWOOD.

Enrolled June 9, 1842.

Specification of the Patent granted to WILLIAM CARRON, *of Birmingham, in the County of Warwick, Lathe-maker, for Improvements in the Construction of Clogs and Pattens.*—Sealed December 21, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention relates, first, to a mode of constructing clogs, by combining a thin flexible metal sole with a divided tread for the fore part of the foot.

Secondly, to a mode of constructing clogs by a peculiar combining of a flexible metal sole with the fore part of the tread.

Thirdly, to a mode of combining a flexible metal sole with the heel of a clog, in order to allow of the clog expanding.

Fourthly, to a mode of making the leather caps for the toes of clogs and pattens.

And Fifthly, to a mode of constructing the iron treads of pattens. And in order that my invention may be most fully understood and readily carried into effect, I will proceed to describe the drawing hereunto annexed.

Description of the Drawing.

Fig. 1, represents a side view of a clog constructed according to part of my invention.

Fig. 2, is a plan thereof, *a*, *a*, is a thin plate of metal, by preference of tempered steel. The heel, *b*, is affixed thereto by rivetting or otherwise, and the back leather, *c*, is fastened to the heel, as is shown. The fore part, *d*, *e*, *f*, is made of separate parts of wood, or leather, or other suitable material, and the parts, *d*, *e*, *f*, are rivetted or otherwise affixed to the plate, *a*, *a*, so that the flexibility of the plate may allow of the fore part of the tread bending between the parts, *d*, *e*, *f*; and it is this peculiarity which constitutes this part of the invention.

Figs. 3, and 4, show two side views of a clog constructed according to the second part of my invention, and it will be seen that although the tread, *d*, is of some length, the plate, *a*, is only affixed at the fore part, so that the plate, *a*, may bend in walking, notwithstanding the length of the tread; and it is this peculiar mode of fixing the plate to the tread only at the fore part that constitutes this part of my invention.

Fig. 5, shows a plan of a clog constructed according to the third part of my invention, and consists of a mode of obtaining an expanding clog, when a thin flexible metal plate, *a*, *a*, is used, and the improvement consists in the manner of attaching the heel to the plate, *a*, there being slots, *g*, *g*, formed in the plate, and there are screws or other instruments with heads, which passing through the slots, are affixed in the heel, *b*, and there is a spring *h*, affixed to the underside of the plate, *a*, and there is a

recess formed in the heel to receive the spring. By this arrangement the heel will at all times have a tendency to remain at the shortest length, but may be extended by the sliding of the plate, *a*, in respect to the heel, and when on the foot the clog will attach itself better than ordinary clogs.

I will now describe the fourth part of my invention, which consists of forming the caps of the fore parts of clogs and pattens, and consists in forming them in tools, without cutting the leather of which the toe caps are formed. I sink a cavity (by preference of iron, though wood or other hard materials may be used), such cavity being of the form of the exterior of the toe cap of a clog or a patten; and I make another tool or "force" convex to the form and size of the interior of the caps. The leather is to be cut into a suitable size and immersed in warm water, and when in a soft state it is to be taken out and rubbed over with "dubbing," oil and grease. The leather is then placed over the concave mould, and the convex tool forced in, compressing the leather between the external surface of the convex tool and the inner surface of the concave mould. The leather is to remain in other tools till sufficiently cold, and may then be japanned as leather is usually japanned (when japanning-leather is used), before making it into caps for the toes of clogs as heretofore practised. In constructing the irons of pattens, it has been usual to make them of rings, the lower surface of which coming to the ground rests on the same plane. Now the object of the fifth part of my invention is to apply irons to the fore parts of pattens, which shall be highest towards the back end thereof, and at the front end approach the toe with curved surfaces, by which means the person using such pattens will be materially convenienced in walking.

Fig. 6, shows an elevation, and

Fig. 7, a plan of a patten according to this part of my invention. *z*, *z*, shows the two surfaces which constitute

the fore metal tread of the patten, and it will be seen that the tread is highest at the back end, at *y*, *y*, and at the fore part the tread approaches the toe of the patten with a gentle curve, as is shown, by which arrangement the person in walking will find great convenience.

Having thus described the nature of my invention, and the manner in which the same is to be performed, I would have it understood, that what I claim is, first, the mode of constructing clogs by combining a flexible metal sole with divided treads at the fore parts of the clogs, as above described.

Secondly, I claim the mode of constructing clogs by a peculiar combining of a flexible metal sole with the fore part of the tread, as above described.

Thirdly, I claim the mode of combining a flexible metal sole with the heel of a clog, in order to allow of the clog expanding.

Fourthly, I claim the mode of making the leather caps for toes of clogs and pattens, as above described.

And Fifthly, I claim the mode of constructing the iron treads of pattens by forming them of a curved surface in front, as above explained.—In witness whereof, &c.

WILLIAM CARRON.

Enrolled June 21, 1842.

Specification of the Patent granted to EDWARD FORD, *of Liverpool, in the County of Lancaster, Builder, for certain Improvements in conducting the manufacture of Salt Cake, or Sulphate of Soda, and Hydrochloric, or other Acids and Alkalies, or other Chemical Processes wherein deleterious vapours are given off, and in the Erection of Furnaces and Works connected therewith.* —Sealed March 8, 1839.

To all to whom these presents shall come, &c., &c.— My improvements in conducting the manufacture of salt cake, or sulphate of soda, and hydrochloric, or other acids

and alkalies, or other chemical processes wherein deleterious vapours are given off, and in the erection of furnaces and works connected therewith, consist in removing the furnaces and other works whereby such chemical processes are effected from the neighbourhood of vegetation, and erecting and working the same afloat upon the seas, or such waters as shall be available for the purpose, whereby the destructive vapours arising and given off from the processes shall be sufficiently removed from land. For this purpose I employ a vessel or flotilla, in or upon which I erect or construct the furnaces and works necessary for the purpose, without in any manner deviating from those usually employed in such chemical processes, excepting having them all afloat in the vessel, flotilla, or raft, and having that moored a sufficient distance from land during the working, so as to remove entirely all deleterious vapour from the surface of vegetation. The vessel or flotilla should be lined with lead, at least under the furnaces, having its sides or edges turned up so as to be hollow upon the top surface, to secure the vessel from injury, in case of any leakage from the furnace.

I would here remark, that the vessel or flotilla must be "trimmed" when working, so as to keep the bed of the furnace as level as practicable. It will also be evident that the situation and distance from land at which the vessel has been moored when working will entirely depend upon the character of the coast, and upon the varying circumstances of the wind, as for instance, if the coast be level and the wind blowing off shore, the processes may be carried on as near as practicable; and I would further remark, in conclusion, that owing to the well-known affinity for moisture of such vapours, I have found it practicable that the nearer the land such flotilla can be moored with safety, the lower the chimney of the furnace may be.

Having now particularly ascertained and described the nature of my said invention, and the manner in which the

same is to be performed, I desire it to be understood that I claim as my invention, and which is secured to me by the above-recited letters patent, the peculiar method of conducting such processes afloat, in the manner and for the purposes herein set forth.—In witness whereof, &c.

EDWARD FORD.

Enrolled, September 7, 1839.

Specification of the Patent granted to JOHN SWINDELLS, *of Manchester, in the County of Lancaster, Manufacturing Chemist, for Improvements in the Manufacture of Prussian Blue, Prussiate of Potash, and Prussiate of Soda.*—Sealed April 16, 1839.

To all to whom these presents shall come, &c. &c.—My invention of an improved method of manufacturing prussiate of soda and Prussian blue, consists in producing the same during the process of manufacturing carbonate of potash, carbonate of soda, and British alkali, commonly called soda-ash. The common method pursued in manufacturing these articles is by forming a mixture of the sulphate of potash or sulphate of soda, lime or carbonate of lime, and small coal, or any other carbonaceous matter, and subjecting them to heat in reverberatory furnaces, and thereby decomposing the sulphates, and producing carbonate of potash or soda, and likewise a quantity of sulphuret of potassium or sodium, according to the article operated upon. In my process I dispense with lime or carbonate of lime, and use along with the various sulphates a quantity of ground coal of the best caking description, and also a quantity of iron filings or boring, in manner following; namely, I take any quantity of the sulphate of potash or sulphate of soda, and fuse them in a reverberatory furnace such as commonly used in the manufacture of alkalies, and then I add by degrees a mixture of small caking coal and iron filings, in the proportion of

one part of iron filings to eight of coal, until I have added to the fused sulphate one-half their weight of coal, or more if the sulphates require it, taking care to stir the materials well during the addition of the coal and iron filings, and also for ten or fifteen minutes after the whole of the coal is added, when the material will be ready to remove from the furnace and allowed to cool. I also produce the same results by mixing, in the first instance, the coal and iron filings with the various sulphates, and then fusing them in the furnace in the usual way, or the iron filings may be omitted in the process, but I prefer the addition thereof. The materials, after being cooled, I take and dissolve in water, and when the solution has subsided, I evaporate the same until it has obtained a specific gravity of 1,320 at a boiling heat, then I transfer it into coolers, when the prussiate of potash or prussiate of soda crystallizes in the course of four or five days. The solution now will consist of carbonate of potash or soda and sulphuret of potassium or sodium, which sulphuret may be removed by the usual methods employed for that purpose. The crystals of prussiate of potash or prussiate of soda will require to be redissolved and recrystallized, when they will be ready for use or sale, or they may be manufactured into Prussian blue in the usual way.

Having now fully described my invention, and in what manner the same is to be performed, I desire it to be understood that I claim as my invention the production of prussiate of potash, prussiate of soda, and Prussian blue therefrom by these methods of decomposing the sulphates of potash and sulphate of soda, by caking coal and iron filings, in the manufacture of potash and soda from these substances, thereby producing both articles by one operation.—In witness whereof, &c.

JOHN SWINDELLS.

Enrolled October 15, 1839.

Specification of the Patent granted to OGLETHORPE WAKELIN BARRATT, *of Birmingham, in the County of Warwick, Metal Gilder, for certain Improvements in the Process of decomposing Muriate of Soda for the Manufacture of Mineral Alkali and other valuable Products.*—Sealed January 19, 1839.

To all to whom these presents shall come, &c., &c.— In the common method of manufacturing sulphate of soda by decomposing muriate of soda or common salt with sulphuric acid, and exposing the mixture to a strong heat in a furnace, muriatic acid gas is disengaged, and is with difficulty condensed. Now, the objects of my improvements in the said manufacture are the following (that is to say):—

Firstly, to effect the decomposition of the common salt without the application of heat, and without the escape of muriatic acid gas, and which improvements I effect in the following manner:—To about 130 parts, by weight, of common salt, dissolved in 400 parts of water, I add 100 parts of concentrated sulphuric acid. To this mixture I put in about 60 parts of metallic zinc, in pieces of moderate size. On adding the zinc, hydrogen gas is evolved or given off, which gas I collect in the usual way in any of the well-known apparatus for collecting and burning gases; the hydrogen gas so collected I burn and apply to the purposes of evaporation, or to any other purpose where light or heat is required. When the zinc is dissolved, and time allowed for the sulphate of soda to form or crystallize, I draw off the clear supernatant solution, which contains chloride of zinc and a portion of sulphate of soda. I then subject this solution to the action of heat, and by evaporation and cooling, the remaining portion of sulphate of soda crystallizes, which I then add to the first crop. I then wash the sulphate off in a hot saturated solution of common salt, which

separates any chloride of zinc which may have remained mixed with the sulphate of soda.

In the above process, it is evident that no heat is employed in the decomposition of the common salt, and that no muriatic acid gas escapes during such operation.

The object of my next or other process is to collect a portion of muriatic acid gas evolved from the mixture of muriate of soda and sulphuric acid, when first brought together in a cold state, and then to finish off the charge, or to complete the decomposition of the salt, and form the sulphate of soda by continuing or carrying out the process hereinbefore described. In this second process I employ any apparatus suitable for the purpose—that known by the name of Woulfe's apparatus will answer very well. To 130 parts of common salt I add 100 parts of concentrated sulphuric acid. The vessel containing the salt and acid must be so constructed as to admit of the mixture being occasionally stirred with any convenient instrument or agitator, as a rake, to facilitate the decomposition of the common salt; that portion of muriatic acid gas used which I wish to collect being taken up by the water in the Woulfe's apparatus in the form of liquid muriatic acid. When muriatic acid gas ceases to evolve, and before the vessels are unluted, I add to the charge sufficient zinc to complete the manufacture of the common salt. The quantity of zinc required for this purpose will be found to be about one-third less than in my first process; and I collect and apply the hydrogen gas evolved from the mixture or charge, and I crystallize the sulphate of soda, and proceed as already described. The solution of chloride of zinc obtained in the above-described processes, I decompose by means of any convenient agent, so as to separate the oxide of zinc; and I have found lime to answer this purpose with the greatest economy. 64 parts of zinc dissolved will require for this purpose about 46 parts of lime of the best quality, and reduced to the

state of cream of lime by slacking and mixing with water; but if after the addition of this proportion of lime the solution should, by the well-known tests, appear to contain excess of acid, no more lime must be used till it ceases to do so. The oxide of zinc thus precipitated I wash with a large quantity of water, to free it as perfectly as possible from chloride of calcuim, and I then use it instead of metallic zinc for the purpose of decomposing fresh portions of common salt. And I would remark, that the oxide precipitated from the solution of chloride of zinc, containing 64 parts of the metal, being used instead of the same quantity of metallic zinc, a little allowance should be made for the loss unavoidable in the process, or the oxide may be employed as a pigment, or in the manufacture of glass, or for any other purpose to which it is applicable. It will be evident that the native carbonate of zinc, and also sulphate of zinc, may be used instead of metallic zinc and the above-described oxide of zinc; but I have not found them to be so advantageous under common circumstances; but I still claim their use as part of my invention.

Having now described my invention, and the manner of carrying the same into effect, I wish it to be understood that I do not confine myself to the use of any particular apparatus hereinbefore mentioned; nor do I claim any privilege with respect to such apparatus, nor the preparation of the muriatic acid. And further, I do not claim lime as a precipitant of zinc, nor the producing hydrogen gas from the decomposition of water. But what I claim as my invention, secured to me by the above in part recited letters patent, is the use and applications of zinc in any form to the decomposition of common salt in the manufacture of sulphate of soda.

And, lastly, I claim as my invention the chloride of zinc, as produced during the decomposition of muriate of soda. And, in conclusion, I would remark, that I do not

confine myself to the proportions here stated, as other proportions may be used, but not with such advantage.—In witness whereof, &c.

OGLETHORPE WAKELIN BARRATT.

Enrolled June 19, 1839.

Specification of the Patent granted to JAMES COLMAN, *of Stoke Holy Cross, in the County of Norfolk, Starch Manufacturer, for Improvements in the Manufacture of Starch.*—Sealed December 9, 1841.

To all to whom these presents shall come, &c., &c.—In manufacturing starch, as heretofore practised, it has been usual to employ wheat, and some attempts have been lately made to use rice as a material for the manufacture of starch, and patents have been obtained for means of making starch from rice. Now the first part of my invention relates to a mode of manufacturing starch by the application of maize or Indian corn.

Secondly, my invention relates to a mode of manufacturing starch by the application of barley.

Thirdly, my invention relates to a mode of obtaining fermentation of rice (when manufacturing starch therefrom), by the application of the offal of wheat or other grain, or some woody fibrous matter.

And Fourthly, my invention relates to a mode of manufacturing starch from rice by the application of acid. And in order that my invention may be most fully understood and readily carried into effect, I will proceed to explain the means pursued by me.

Description of the Process of Manufacturing Starch from Maize or Indian Corn.

I put the maize or Indian corn into a vessel and cover it with water in order to soften it. After soaking three or four days, the water is to be drawn off either by a tap

or plug-hole at the bottom of the vessel, or with a syphon. The maize or Indian corn is then to be reduced to a fine pulp or creamy state, by passing it through rollers or levigators, or by other mechanical means adapted to such purposes. In this part of the process it will be necessary to use water with the maize or Indian corn. I then put the maize or Indian corn into a vessel, and allow it to remain till the fermentation has separated the starch from other matters, which I have found will be done in about twelve or fifteen days. If it should be found, after passing it through the rollers or levigators, there is too much water, so that the fermentation would be impeded, I then, by means of a syphon or tap, draw off a portion of the water. I then wash the starch through sieves, which is allowed to settle in a frame, and which is afterwards washed, strained, and finished in the usual way of manufacturing wheat starch. I would remark, that although I have been particular in describing the usual means pursued by me, and which I believe to be the best, yet I do not confine the operation thereto so long as the peculiar character of this part of my invention be retained, whereby the maize or Indian corn is acted on in a suitable manner to dissolve or separate the gluten and other matters, and thus to obtain the separation of starch therefrom. And I would state, that in place of simply fermenting maize or Indian corn, the process of separating the gluten and other matters may be performed by means of a dilute caustic alkali, as follows:—I make a solution of real soda or real potash and dilute it, till, by means of a test-acid, I find the solution to contain two hundred grains of real soda or real potash to the gallon. To every fifty-six pounds of maize or Indian corn, which has been previously soaked and levigated as before mentioned, I add fifty-six gallons of the solution or brown liquor, with a syphon or tap. I then make another solution one-half the strength of the former, and add it to the maize or Indian corn in the proportions before mentioned. I allow it to remain

two days, taking care to stir it well once in every three hours, and after settling for eighteen hours the solution is again drawn off, and the starch is washed through sieves, settled, strained, and finished in the usual mode of manufacturing wheat starch. I would remark, that although I have mentioned caustic soda or potash as the alkali, I do not confine myself thereto, but I believe those alkalies to be the best for the purpose, or a solution of an alkaline salt may be used. I generally use carbonate of soda or carbonate of potash. I put seven pounds of carbonate of soda or carbonate of potash to three and a-half gallons of water, and when dissolved I add to it one hundred weight of maize or Indian corn (which has been previously soaked and levigated as before mentioned), stirring it well for half-an-hour. I then allow the matters to remain in the frame for three days, stirring it well every four hours, and then, having allowed it to settle for eighteen hours, I draw off the liquor containing the gluten, and I make another solution of the same strength as the former solution, and add it to the maize or Indian corn in the proportions above mentioned, which is treated in the same way as before stated, and then, after settling for eighteen hours, the liquor is again drawn off, and the starch is washed through sieves, settled, strained, and finished in the usual way of manufacturing wheat starch. Although I have described carbonate of soda or potash, I do not confine myself to those salts; or, in place of the above processes, an acid may be used as hereinafter described, in respect to the manufacture of starch from rice; but I do not claim the process of fermentation, nor of caustic alkali, nor of alkaline salt, nor of acid, when separately considered: the first part of my invention consisting in the combination of the use of maize or Indian corn with such processes in the manufacture of starch.

Description of Manufacturing Starch from Barley.

The barley is first reduced to a meal or flour by the

process of grinding similar to that practised where wheat is used, which is put into a vessel, to which is added a sufficient quantity of water to create fermentation; it is then stirred up, and care must be taken that the whole of the barley is made wet. At the end of about ten or twelve days it is washed through sieves, and subjected to the same process as that which is usually adopted for the manufacturing of starch from wheat. But I would here observe, that I sometimes adopt another method, by soaking unground barley in water four or five days, and reduce it to a pulp or creamy state, by passing it through rollers or levigators, or by other mechanical means adapted to such purposes. The pulp is then put into a vat, and allowed to ferment for about ten or twelve days. If it should be found, after passing it through the rollers or levigators there is too much water, so that the fermentation would be impeded, I then by means of a syphon or tap draw off a portion of the water. The starch is then washed, and the subsequent process is adopted in the same manner as heretofore practised in the manufacture of wheat starch. I do not confine the operation to the above means, so long as the peculiar character of this part of my invention be retained, whereby barley is acted on in a suitable manner, to dissolve or separate the gluten and other matters, and thus obtain the separation of starch therefrom. And I would state, that in place of simply fermenting barley, the process of separating the gluten and other matters may be performed by means of dilute caustic alkali, as follows:—I make a solution of real soda or real potash, and dilute it till by means of a test-acid I find the solution to contain 200 grains of real soda or real potash to the gallon. To every 56 lbs. of barley, which has been previously reduced to a meal or flour by the process of grinding, or soaked and levigated as before mentioned, I add 56 gallons of the solution, which must be well mixed. I allow it to remain three days, stirring it every three hours. Having allowed it to settle eighteen

hours, I then draw off the solution or brown liquor with a syphon. I then make another solution one-half the strength of the former, and add it to the barley in the proportions before mentioned. I allow it to remain two days, taking care to stir it well once in every three hours, and then, having allowed it to settle for eighteen hours, the solution is again drawn off, and the starch is washed through sieves, settled, strained, and finished in the usual way of manufacturing wheat starch. I would remark, that although I have mentioned caustic soda or potash as the alkali, I do not confine myself thereto, but I believe those alkalies to be the best for the purpose: or, a solution of an alkaline salt may be used. I generally use carbonate of soda or carbonate of potash. I put seven pounds of carbonate of soda or carbonate of potash to three gallons and a-half of water, and when dissolved I add to it one cwt. of barley (which has been previously soaked and levigated as before mentioned), stirring it well for half an hour. If the barley has been previously ground in a dry state, in that case, before the solution is added, a sufficient quantity of water must be mixed with the meal or flour, to bring it to the consistency of cream. I then allow the matters to remain in the frame for three days, stirring it well every four hours, and then, having allowed it to settle for eighteen hours, I draw off the liquor containing the gluten, and make another solution of the same strength as the former solution, and add it to the barley in the proportions before mentioned, which is treated in the same way as before stated. The liquor is again drawn off, and the starch is washed through sieves, settled, strained, and finished in the usual way of manufacturing wheat starch. Although I have described carbonate of soda or potash, I do not confine myself to those salts; or, in place of the above processes, an acid may be used, as hereafter described, in respect to the manufacture of starch from rice; but I do not claim the process of fermentation, nor of caustic alkali, nor of alkaline salts, nor

of acid when separately considered: this part of my invention consisting in the combination of the use of barley with such processes in the manufacture of starch.

Description of the Mode of obtaining Fermentation of Rice in the Manufacture of Starch therefrom.

Before describing the third part of my invention, which relates, as before stated, to a method of obtaining fermentation of rice when manufacturing starch therefrom, by the application of the offal of wheat or other grain, or some woody fibrous matter, I would state that rice contains other vegetable matters besides the starch, and that it is necessary to separate them from such other vegetable matters. One means of effecting such separation is by fermenting the rice when the rice is deprived of the outer bran or pellicle. I have not found it to ferment sufficiently to separate the starch from the other vegetable matters, or if it has fermented, the process has been so slight and slow as to render it practically useless; and I have discovered that by adopting the following plan rice may be fermented:—I put the rice into a vessel and cover it with water in order to soften it. After soaking four or five days the water is then to be drawn off, either by a tap or plug-hole at the bottom of the vessel, or with a syphon. The rice is then to be reduced to a fine pulp or creamy state, by passing through rollers or levigators, or by other mechanical means adapted to such purposes. In this part of the process it will be necessary to use water with the rice. I then put the rice, as reduced, into a vessel, and mix with it from twelve to fifteen pounds of the offal of wheat or other grain, or some woody fibrous matter, to every cwt. of rice. They are to be well mixed together, and if there is not sufficient moisture to wet the whole of the materials, water must be added. When the fermentation has separated the starch from the other matters in the rice, which I have found will be done in about twelve or fifteen days, I wash the

starch through sieves, and allow it to settle in a frame, and it is afterwards washed, strained, and finished in the usual way of manufacturing starch.

I now proceed to describe the fourth part of my invention, which relates, as before stated, to a mode of manufacturing starch from rice, by the application of acids. I put the rice into a vessel and cover it with water in order to soften it. After soaking three or four days the water is to be drawn off, either by a tap or plug-hole at the bottom of the vessel, or with a syphon. The rice is then reduced to a fine pulp or creamy state, by passing it through rollers or levigators, or by other mechanical means adapted to such purposes. In this part of the process it will be necessary to use water with the rice. I put the rice into a vessel and allow it to settle, after which I draw off the water on the top with a syphon. I make a solution of acid, by putting from three quarters of an ounce to one ounce of acid (I have found muriatic acid to answer best) to one gallon of water. I then put one gallon of the solution to every two pounds of rice, and allow it to remain five days, stirring it well every four hours at the least; and then, after allowing it to settle for eighteen hours, I draw off the water from the top with a syphon. I make another solution of acid two thirds the strength of the previous solution, and mix with the rice in the proportions before mentioned, and allow it to remain five days longer, stirring it every four hours at least; and then, having allowed it to settle for eighteen hours, I draw off the water, and wash the starch through sieves, which is afterwards subjected to the same process which is usually adopted in the manufacture of starch.

Having thus described the nature of my invention, and the manner in which the same is to be performed, I would have it understood, that what I claim is,

First, the mode of manufacturing starch by the application of maize or Indian corn, by means of one or other of the processes above described.

Secondly, I claim the mode of manufacturing starch by the application of barley, by means of one or other of the processes above described.

Thirdly, I claim the mode of manufacturing starch by fermenting rice, by the aid of the offal of wheat or other grain, or some woody fibrous matter.

And, fourthly, I claim the mode of manufacturing starch from rice, by the application of acid, as above described. —In witness whereof, &c.

J. Colman.

Enrolled June 9, 1842.

Specification of the Patent granted to Edmund Morewood, *of Highgate, in the County of Middlesex, Gentleman, for an Improved Mode of preserving Iron and other Metals from Oxidation or Rust.*—Sealed August 27, 1841.

To all to whom these presents shall come, &c., &c.— I do hereby declare the nature of the said invention to consist in tinning the metals so to be preserved from oxidation as aforesaid, in the ordinary manner of what is called tinning, and then, in what I call zincing the said tin, so that the external surface may be zinc, placed in such relation with the tin and the metal to be preserved from oxidation, as that both the said tin and zinc should have an united or combined influence in preserving the said metal: and in further compliance with the said proviso, I, the said Edmund Morewood, do hereby describe the manner in which the said invention is to be performed by the following statement thereof (that is to say):—I take a piece of iron or any other oxidizable metal whose fusing point is not less than 1200° Fahrenheit, capable of being tinned, and having tinned it well and evenly by any of those means now in use for that purpose, and too well known by competent workmen to need any particular

description here; the coating of tin having become firmly set and hard, and having been well cleaned, I immerse the tinned metal in molten zinc of the purest kind, and the surfaces of which having been carefully skimmed, I keep covered with a flux of sal ammoniac, thrown upon it in the state of powder. I suffer the tinned metal to remain in the molten zinc, which should be kept fluid, and as nearly as possible at the melting point, until, on drawing the tinned metal out of it slowly, the zinc surface presents a smooth and even appearance. If the tinned metal be an article so large that it would lower the temperature of the molten zinc sensibly on being immersed in it, I heat it, but not to a temperature sufficient to soften the coating of tin before introducing it into the melted zinc, and before taking it out, I move it gently about in the molten zinc, and when I remove it, I draw it out rather slowly, in order to avoid taking up superfluous metal. I consider that it is well, when practicable, to melt the zinc, which should be of the purest kind, in an earthen crucible; but if one of very large size be required, I use a welded wrought-iron vessel, cast-iron being, as I conceive, objectionable if brought in contact with the zinc, and attention is necessary to keep the molten zinc clean and free from all dirt and oxide, for which purpose, after skimming it, I keep the surface constantly covered with a flux of sal ammoniac, as aforesaid. After taking the tinned metal out of the molten zinc, I immerse it in clean water almost immediately, whilst the plate is still hot, and then scrub and clean it therein, and afterwards dry it in bran or sawdust.

Now whereas I am aware that certain colourable alloys of tin might perhaps answer the same purpose as tin, and that certain colourable alloys of zinc might, perhaps, also answer the same purpose as zinc for the purposes of this invention, but as those alloys could only answer well in proportion as the alloy interfered little with the action of

the two properties required from the tin and zinc alone for the purposes aforesaid.

I claim as the said invention the preserving of iron and other metals capable of being tinned, and fusing at a temperature of not less than 1200° of Fahrenheit from oxidation, by tinning them and then dipping the tin covering or surface in molten zinc as aforesaid, or otherwise coating the said tin covering or surface with zinc in such manner that a union or contact shall take place between the surfaces of the zinc and tin, whereby I cause a united or combined influence to be exerted in the preservation of the said iron or other metal, and which influence I believe to be that the zinc prevents the destructive influence of the tin upon the iron or other metal when tin alone is used, and that the tin lessens the destructive influence of the iron or other metal upon the zinc when zinc alone is used to cover the said iron or other metal, and such invention being to the best of my knowledge and belief entirely new and never before used within that part of Her said Majesty's United Kingdom of Great Britain and Ireland called Ireland, I do hereby declare this to be my specification of the same, and that I do verily believe this my specification doth comply in all respects fully and without reserve or disguise with the proviso in the said hereinbefore in part recited letters patent contained. Wherefore I hereby claim to maintain exclusive right and privilege to the said invention.—In witness whereof, &c.

EDMUND MOREWOOD.

Enrolled February 27, 1842.

LAW REPORTS OF PATENT CASES.

Common Pleas, Westminster Hall.

Before Lord Chief Justice TINDAL *and a* SPECIAL JURY.

February 11, 1840.

CRANE *v.* PRICE *and* OTHERS.

(Continued from page 115.)

Sir F. Pollock.—Gentlemen, I now proceed to the fourth plea. The defendants say that the nature of the invention is not truly described in the specification. And we have with reference to that point certain notices of the objections that are intended to be raised. Now, Gentlemen, we have received, as the late statute requires, certain objections, to be delivered to us at the time of the delivery of the pleadings, and the defendant is confined to the objections so stated. I find the eighth and ninth objections are these,—"That the specification is defective, inasmuch as it does not describe the kind of furnace to which the alleged invention is applicable, and it is not applicable to all kinds of furnaces." Gentlemen, it is applicable to all the furnaces which are alluded to in the specification. It may not be applicable to all, but it is applicable to any ordinary furnace that is made that is so constructed as to be in blast, and capable of having a hot air blast applied to it in the manner which the witnesses will describe to you by and by.

The next objection is this,—"That the specification does not clearly state whether or not it is intended to the use of anthracite or stone coal and culm as the only fuel, or whether it is intended to include the use of anthracite or stone coal and culm together with other fuel."

Gentlemen, that, I take it, is rather an objection which my Lord will dispose of, and I think I shall have very little difficulty in dealing with it as the forms of law require. We have pointed out what is to be done, and it

is no part of our intention to state the details beyond those which are necessary to carry out the principle. The great object of the invention is, by the combination of the hot air blast and the stone coal, to produce an article which I have exhibited to you, and which will presently be characterized by the evidence of the witnesses. That is the great object, and there is a detail in the specification which, to those who are acquainted with the subject, will enable anybody to carry it into effect; and I shall call before you an abundance of persons professionally and practically acquainted with the subject, who will tell you that no one will have any difficulty in carrying into effect the object in the specification.

Now, Gentlemen, I pass to another, the fifth plea, on which it is a question much more, I apprehend, for his Lordship than for you. As to the points that arise on it, his Lordship will forgive me if I invite his attention for a moment to the statement I am about to make on the points arising on that plea.

The Lord Chief Justice.—In fact, the greater part of this seems to me to be matter of law.

The Solicitor-General.—It is, my Lord.

The Lord Chief Justice.—You might almost make a case of it. The question is whether the plaintiff is first inventor. If they have any evidence to show that a hot blast was applied to anthracite before, why then, *cadit questio.*

The Solicitor-General.—It will terminate beyond all doubt in a question of law, my Lord. There are some facts that are material,—when the gentleman invented it, and when he got his patent, that is material, and some other things.

Sir F. Pollock.—I was about to call his Lordship's attention, and yours, Gentlemen, to the points that arise on the fifth plea. The plea states in substance this—that one James Beaumont Neilson obtained letters patent as far back as the 12th of September, 1828; the specifica-

tion was enrolled on the 3d of March, 1829. The patent, therefore, has a few years to run—three years, probably, at least more than two. And they set out the specification of James Beaumont Neilson, and then, after alluding to a clause in the patent, they say this,—"That the said improved application of air in the said last-mentioned letters patent mentioned and referred to, and for which the same were so granted as aforesaid, was and is the production and application of a hot air blast, for the purpose of heating fires in forges and furnaces where bellows or other blowing apparatus were required; which said hot air blast was long before, and at the time of the granting of the said letters patent, in the said declaration mentioned, and still is, publicly used and exercised in England, by and with the license and consent of the said James Beaumont Neilson, and not otherwise, in the smelting and manufacture of iron from iron-stone mine or ore, and was and is the said hot air blast in the said specification of the plaintiff mentioned and referred to." And the defendants further say, that the said letters patent so granted to the said James Beaumont Neilson, as aforesaid, were at the time of the granting of the said letters patent, in the said declaration mentioned, and still are, in full force and effect; and the said term of fourteen years therein mentioned, was at the time last aforesaid, and still is, existing and wholly undetermined; and that in consequence thereof, the plaintiff could not at the time of the granting of the said letters patent, in the said declaration mentioned, or at any time since, nor can he now lawfully use the said hot air blast, in the said specification mentioned, in the smelting or manufacture of iron, without the special license and consent of the said James Beaumont Neilson for that purpose being first had and obtained." Then, Gentlemen, the replication takes issue upon this fact.

The Lord Chief Justice.—The replication sets it out.

Sir F. Pollock.—Sets out Neilson's specification?

The Lord Chief Justice.—You see the issue and the rejoinder precisely put there.

Sir F. Pollock.—And then the plea says,—"That the said using by the plaintiff of the said hot air blast in the said specification mentioned, in the smelting and manufacture of iron from iron-stone mine or ore, as described in the said specification, combined with the said anthracite or stone coal or culm, as therein also mentioned, was and is an using and imitating of the said invention of the said James Beaumont Neilson, for the sole use, and exercise, and benefit whereof the said letters patent were so granted to the said James Beaumont Neilson, as aforesaid, contrary to the form and effect, true intent and meaning of the said proviso." And then in the rejoinder that is brought precisely to this issue,—whether it was an using and imitating of the invention of the said James Beaumont Neilson.

Now, Gentlemen, here I must entreat your indulgence, and his Lordship's, for a moment, while I enter into a question which certainly is rather more dry, I think, than what we have hitherto had, with respect to the improvement of the manufacture of iron. It is a mere question of pleading. But I apprehend that the true question raised on that plea is this,—whether it is impossible for any one to use a hot air blast of any sort without infringing the patent of Mr. Neilson; because if there be a single mode, if there be any possible hot air blast of any sort that is not Neilson's, then I apprehend that the issue raised upon these pleadings must be found for the plaintiff. Now, be it that Neilson had discovered one mode of issuing a hot air blast for any purpose whatever, not applying it at all events to the making of iron with stone coal. When Mr. Crane came to make his discovery, he says this: he gives to the world this as his discovery:—use a hot air blast at a temperature of about 600 degrees of Fahrenheit. Gentlemen, that is, I believe, the temperature at which lead will melt. I suppose you are

immediately aware from that, that it is a very high temperature. I think it is just about the temperature at which lead will melt. Neilson's patent has nothing upon earth to do with that. In a moment I will call your Lordship's attention to Neilson's specification, and to another specification that preceded it, for the purpose of showing that there did exist before Neilson's patent a mode described of a hot air blast for a furnace. Undoubtedly there did exist one, and if there existed any one or more, all that Mr. Crane was called upon to do was to say this:—"Now, I care not where you get, or how you get, your hot air blast; whether you get it by license under Mr. Neilson; whether you get it by the means that were given to the public before that; or whether you get it by some other improved method not within Mr. Neilson's, and not within the scope of his patent; in whatever way you get it, I care nothing about it. The use of the hot air blast is now well known." Gentlemen, I will prove to you, that a hot air blast and the mode of producing it was just as well known as the use of a common pair of bellows for the purpose of blowing a common fire. Mr. Crane says:—"I claim the hot air blast as no part of my discovery; I merely claim the using it in combination with anthracite; I claim not that even as against any patent; but I claim only the combination. If it requires that I should have a license from Neilson to use his particular hot air blast, I admit I must get that license; and if I can do it without Neilson's license, then I have a right to operate without that license. But I give you my discovery as I find it, and I am not bound to wait until Mr. Neilson's patent runs out, even if Mr. Neilson had a complete monopoly of all the hot air blasts in the world."

Gentlemen, I take it (subject to any correction from his Lordship)—I take this to be quite clear. Suppose the steam-engine, merely as an instrument of power, were perfectly new, and had been the subject of a patent for

some ten years, a few years remaining to run, and a person discovered that the steam-engine could be applied to shipping; I say, any person who made that discovery in some particular construction or form of the vessel, by arranging with respect to paddles, and so on, that the application of that form would have rendered effectual, would be entitled to a patent; and although in the meantime he could not use the invention or discovery without a license from the person who had invented the steam-engine, yet the moment the steam-engine became a free subject for all the world, then his patent would be in full force. But in the meantime the discoverer of the steam-engine could not apply even the steam-engine itself to this new purpose to which the discoverer had applied it by his invention and skill. This was distinctly recognised in a case. I am reluctant to refer to a case in the books in addressing a jury. There is no doubt about this: I say, that it is a question that his Lordship would have no difficulty whatever in dealing with. A patent may be taken out distinctly as an improvement on another man's patent: but we do not take out a patent to improve a hot air blast, nor have we anything to do with hot air blast beyond this. We have discovered that the hot air blast used in a particular manner for a particular purpose will produce a particular result, incomparably better than has been done by the combination of any other matters to produce the same results. If we cannot use a particular form of hot air blast without a license, undoubtedly we must get that license; but all the world is bound to know what matters are patented and what are not. If you wish to use something for which Neilson has got a patent, you will go to him for a license. If there be any other hot air blast which you may resort to, you may use that without Neilson's license; therefore the real practical question is this,—Has Mr. Neilson a patent which actually excludes anybody, under any circumstances, from using every description of hot air blast

at a high temperature or a low temperature? Has Mr. Neilson got the entire command of every description of hot air blast, from the highest to the lowest temperature, and under every form, shape, and circumstance under which a hot air blast can be used? Gentlemen, when it comes to be examined it will turn out that Mr. Neilson has no such patent.

Now, I beg to state, in the first place, that before Neilson obtained any patent for a hot air blast, a person of the name of Botfield had discovered that hot air might be used, and had pointed out a method of using it. Gentlemen, I have here the specification of a patent granted to Botfield. The specification is enrolled on the 2d April, 1828, Neilson's patent having been enrolled in March, 1829, and therefore Botfield's invention anticipated Mr. Neilson's by a period very nearly of twelve months. Mr. Botfield takes out a patent for certain improvements in making iron, or in the method or methods of smelting or making iron; and he says this:—"Now know ye, that in compliance with and agreeable to the true intent and meaning of the said proviso, in the said letters patent contained, I, the said Thomas Botfield, do hereby declare that the following is a particular description of the nature of my said invention and methods and improvements in the smelting and making of iron, in respect to principle, and the way and manner in which the same may be performed; that is to say, the principle is for causing or obtaining a blast of atmospheric air sufficient to smelt, fuse, run, or make pig, cast, or crude iron from ironstone or ore. This blast is to be produced by means of rarefied air, gas flame, or heated air, from an oven or fire-place, and is to be applied in or to a blast furnace, cupola, or air furnace. This I propose to effect by the draft of a powerful chimney or chimneys, which may be built separate, at any distance that may be most convenient, or may join to, or be made part of the blast furnace or

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cupola, as may be found most desirable and best to answer the purposes required, and which is to be connected by a flue or flues with the cupola blast or air furnace; but in case this draft should not prove sufficient for the purpose of smelting the ironstone or ore, I propose and intend to apply and use the common blast from machinery to assist the draft from the draft of the chimney. This is to be used at the same or any other twire." (A twire is the aperture or nozzle of the blower which goes toward the furnace to pour in the air, whether heated or not.) "And I claim a right and mean to use the atmospheric air, either separate or mixed with gas flame or heated air. I also claim as part of my patent the right to use and mix (with the other materials) rock salt." That is another application relating to the improvement of iron, that does not touch on this subject. Then he says, after describing his apparatus, that there is a fire, and that there is a quantity of air that passes near that fire for the purpose of being heated. And he claims to use a blast furnace for the purpose of propelling that heated air into the furnace for the purpose of smelting the iron; and he then goes on thus, Gentlemen:—"And I further declare that I propose to use coal, coke, stone-coal, culm, wood, charcoal, or any other kind of fuel or fuels, or combination of fuel, in any proportion or proportions, in the fire-place, oven, or air furnace, for the purpose of producing the gas flame or heated air, and also to use all the materials before recited, in any proportion or proportions that may be found sufficient and best adapted to produce the main object required. I claim as my patent the use of the additional chimney or chimneys, and the application of rarefied air, or gas flame, or heated air, at or near the twire or twires of the blast furnace or cupola, to cause or assist the blast of atmospheric air," and so on. So that it is quite clear that long before Neilson took out any patent, Mr. Botfield had discovered one mode of using a

blast furnace with heated air, so as to bear upon the materials in the furnace, namely, the mixture of the fuel and the ironstone or ore.

Then, Gentlemen, comes Neilson's Patent. Mr. Neilson's is this. His invention is, "An improved application of air to produce heat in fire forges and furnaces where bellows or other blowing apparatus are required. Now know ye, that in compliance with the said proviso, I, the said James Beaumont Neilson, do hereby declare that the nature of my said invention for the improved application of air to produce heat in fire-forges and furnaces where bellows or other blowing apparatus are required, and the manner in which the same is to be performed is particularly described and ascertained, as follows, that is to say, a blast or current of air must be produced by bellows or other blowing apparatus, in the ordinary way, to which mode of producing the blast or current of air this patent is not intended to extend. The blast or current of air so to be produced is to be passed from the bellows or blowing apparatus into an air vessel or receptacle made sufficiently strong to endure the blast, and through or from that vessel or receptacle into a tube-pipe or aperture into the fire-forge or furnace. The air vessel or receptacle must be air tight, or nearly so, except the apertures for the admission or emission of the air, and at the commencement and during the continuance of the blast it must be kept artificially heated to a considerable temperature. It is better that the temperature be kept to a red heat or nearly so, but so high a temperature is not absolutely necessary to produce a beneficial effect. The air vessel or receptacle may be conveniently made of iron; but as the effect does not depend upon the nature of the material, other metals or convenient materials may be used. The size of the air vessel must depend upon the blast, and on the heat necessary to be produced. For an ordinary smith's fire or forge, an air vessel or receptacle capable of containing 1,200 cubic inches will be of

proper dimensions, and for a cupola of the usual size for cast iron founders, an air vessel capable of containing 10,000 cubic inches will be of the proper size. For fires, forges, or furnaces upon a greater scale, such as blast furnaces for smelting iron and large cast iron founder's cupolas, air vessels of proportionably increased dimensions and numbers are to be employed." You observe, that what Neilson speaks of is a large vessel which is to be kept heated, and into which you are to pour or drive the air, and then it is to be heated there and to pass out into the furnace; and he gives you dimensions for an ordinary smith's forge—1,200 cubic inches would be required. It will give you some notion of the size, when you are told that an ordinary imperial pint is somewhere about thirty inches; that is, about 400 pints: dividing 1,200 cubic inches by thirty, or ten inches by twelve, ten inches one way and twelve the other, will give you a notion of it. If you get a larger one, it says 10,000 cubic inches will be the proper size; that of course would be ten times as large as that. Gentlemen, that is Neilson's invention, if you are to call that an invention after what Mr. Botfield had done before. But Mr. Neilson surely does not mean to say, that there is no other mode of dealing with a blast furnace and with heated air, but what will come within the scope of what is here described. Why it says, "the air vessel may generally be conveniently heated by a fire distinct from the fire, to be effected by the blast or current of air, and generally it will be better that the air vessel and the fire by which it is heated should be enclosed in brickwork or masonry, through which the pipes or tubes connected with the air vessel should pass." The manner of applying the heat to the air vessel is, however, immaterial to the effect, if it be kept at a proper temperature. I do not find what that temperature is, nor do I find any description of the apparatus. Mr. Neilson gives no plan, no plate, no dimensions, nothing but this description I have read to you; and, in

point of fact, all the apparatus that Mr. Neilson ever put up corresponded with that description, in having a large air vessel, as he describes, increasing in dimensions according to the size of the furnace upon which it was to operate. Gentlemen, in reality many constructions were in use, in very general use throughout many parts of the kingdom, both in Scotland and in other places, and this is one of the modes (referring to a model), and this is the best. There is no air vessel at all, the air is made to pass through these tubes; it is heated and passes through them, and it comes out at the extremity at a temperature which Neilson's plan, or anything which he has suggested, could never produce. There is no possibility, by anything that Neilson has described, of getting the air to a temperature of 600. If Neilson be put into the box, or any body who has ever worked under Neilson, I defy any person to say that by an apparatus constructed under Neilson's directions, or upon Neilson's plan—I defy any person to say that you ever get to a temperature of 600. A temperature of 600 is necessary, it is essential to the success of Mr. Crane's operation; it cannot be obtained without it—I mean without something near to that: you may fall short of the 600 by 20, 30, or 40, or something of that kind; but it is preferable, he says, to keep it up precisely to that temperature. This is the sort of apparatus which is in use universally in many parts of Scotland, in many parts of Yorkshire, I believe, and Staffordshire, and this, undoubtedly, Mr. Neilson does not in the least degree aim at. I submit, therefore, whether you take the substance of that issue (my Lord, as a matter of law, will tell you what it means), or whether you take the fact as I believe it will be presented to your senses, and made out in evidence, that which is done or proposed to be done is not that which Neilson desires to be done; but if this were within Neilson's patent, unless there be no mode of using any possible hot air blast except that which Neilson may claim as his, Gentlemen, I apprehend this

issue cannot be maintained on behalf of the defendants. It is, after all, Gentlemen, not very important; I am sorry that we are here trying it; certainly we could not very well avoid it, because we believe the fact to be as we state it: but if the issue is found one way or other I do not believe it will have any influence on the ultimate judgment of the Court, because whether that which we allude to is already the subject of another patent, or is common to all the world, that does not in the slightest degree interfere with the right to apply the patented invention to a purpose entirely new. If you require to have a license from Neilson for the purpose of using it, you are to get that license. It has been certainly decided, and I apprehend it is undoubtedly law, that you are not bound to do more than to give to the world your invention. Your invention may be an improvement of that which is already the subject of a patent, or it may involve the use of something which is already the subject of a patent; still whether that be so or not, while your monopoly, granted by the Crown for the protection of industry and as the reward of genius exists, no one has a right to interfere with that; no one can plough with your heifer, no one unless he has your permission can do so, and we charge the defendant that he has interfered to that extent with our invention.

Now, Gentlemen, I am obliged to my Learned Friend Mr. Richards, for suggesting an illustration very familiar, but which seems to me to be very pertinent. What Neilson proposes to do, beyond all doubt, is to allow air to pass through some large space that is kept in a state of exalted temperature. He tells you to increase your vessel in proportion to the size of your furnace. He gives you no figures, he gives you no details, he does not tell you beyond that that you are to enlarge your vessel in proportion to the furnace. As my friend was suggesting to me, as good an illustration as we can give of Neilson's discovery is this:—Force your air into an

oven, and heat that oven by surrounding it with fuel, and then let the air pass out at the other side. Subsequently it was found that it was advantageous to check the air a little, and some divisions were put up, so as to make it pass up and down, and up again.

Now all this was after Neilson's patent and specification were before the public; and until some person discovered—I think a person of the name of De Vaux took out a patent upon that—until some person whose discovery this was, quite of late years, certainly not in connexion with Neilson—until it was discovered by sending the air merely through these tubes exposed to heat and without any air vessel at all, until that was brought to something like perfection by the experience, and the sagacity, and the perseverance, and the industry of others, the hot air blast that Mr. Neilson gave to the world, and as he practised it for years after the patent was given to the public—that hot air blast never would have answered the purpose of Mr. Crane. I say again, if Mr. Neilson is here, or any body who ever acted under Mr. Neilson, or ever had erected any hot air blast under Mr. Neilson's superintendence, or any body in connexion with him, be put into the box to-day, that man must confess that never did he under Mr. Neilson's plan ever raise the temperature to more than 200 or 300; as to raising it to 600 was perfectly out of the question, it was impossible, the thing could not be done.

Now, Gentlemen, I am aware of a fact stated in the plea. They say, "Aye, but you, Mr. Crane, have taken a license from Mr. Neilson." Gentlemen, that has nothing to do with the issue, as his Lordship will tell you, but it is a fact perfectly true. Mr. Crane did take a license under Neilson to act with his patent, and the reason for doing that is perfectly plain. Mr. Crane's invention was of infinite importance—I believe in point of value and importance, as I have said, there has been no invention of modern times that can compare with it in the benefits

that it has conferred upon all that part of the country. Mr. Crane was desirous by every possible means to carry it on to the utmost perfection, and having occasion to see what improvements had been made upon hot air blast, which, after all, was no part of his invention, he never could tell but that many of the experiments he was making might be considered as falling within Neilson's patent, and therefore it was very much better for him to pay the very small sum, which he undoubtedly did, rather than to go to law with Mr. Neilson, and involve himself in litigation at the earliest moment when his patent came before the public. In order to entitle himself to use hot air blast of any sort, he had undoubtedly a license from Mr. Neilson, but that will not change the character of Mr. Neilson's patent, nor destroy the fact. The question is this, whether the plan, the very possible plan alluded to and suggested by Mr. Crane, is within the scope and compass of Mr. Neilson's invention? Gentlemen, I deny that to be the case, and I think, Gentlemen, when you come to see all that has been done, whether under Mr. Neilson or since Mr. Crane's invention was known to the world, you will be of the same opinion. I regret that we should be involved in a discussion which, after all, is of very small importance. Whether it was or was not, it was the opinion of my Learned Friend, whose assistance I have, that we had better traverse the fact, believing it (as we did) not to be true, than demur to the plea in point of law, where we thought we had a clear ground to ask for the judgment of the Court. I believe this issue to be comparatively of no sort of importance, but still as regards trying the fact, I maintain that Mr. Crane is entitled to your verdict on that issue. For he does not use, he does not suggest the use exclusively of Mr. Neilson's invention, but he refers to any mode, and there were plenty of modes known of obtaining a hot air blast. His patent is not for a hot air blast, it is not for a mode of getting it, it is not for a mode of raising it to a tem-

perature of 600, but he says, "Get that hot air blast in any way in which you can obtain it, whether by the new mode, or the old mode, or made under the license, or without the license, but get it, and when you have got it apply it to the making of iron with the assistance of stone-coal, and you will produce that superior article for which I claim taking out a patent, which is valid in point of law." Gentlemen, I have adverted to all the points that are likely to arise in this cause. I do not in the slightest degree regret that his Lordship thinks it may not occupy so much of your time and attention in the points of fact, inasmuch as a great deal of law may be considered to be involved in it. I have thought it right to make this statement; by and by I shall produce evidence to bear out the whole of that statement; by and by we shall hear what my Friend's case is on the other side; as to which I must only state that I do not know precisely, nay, that I do not know even in a general way—although we have been in the Court of Chancery, and have had all the benefits that arose from the discussion which took place there: I have got piles and heaps of affidavits, and my attention was called to them—and I must say still, that I have not collected from those affidavits with that sort of distinctness what my Friend's case is, sufficient to induce me to anticipate or to say anything about it. Therefore it is better that my Friend should state his own case. When he does so he will support it with some sort of evidence; if so, I shall have an opportunity of addressing you again. I hope that will be as early as possible, but I am afraid it will hardly be in the course of the present day. Witnesses will be called before you on the part of the plaintiff; I am afraid they must take up some considerable time. There is a good deal of detail through which we must necessarily wade, and I entreat your patience and indulgence; and I am sure you will be quite ready, at the close of the case,

to do nothing but what is just between the parties who are before you to-day.

Mr. Richards then put in the Specification of the plaintiff's patent, and of Botfield's, Neilson's, and De Vaux's patents.

(To be continued.)

PATENTS GRANTED FOR SCOTLAND,

From June 25 *to July* 25, 1842.

John Americus Fanshawe, of Hatfield-street, in the parish of Christ Church, in the county of Surrey, Gentleman, for an improved manufacture of waterproof material, applicable to the purposes of covering and protecting surfaces, bodies, buildings, and goods exposed to water and damp.—Sealed June 29, 1842.

James Boydell, Junior, of the Oak Farm Works, near Dudley, in the county of Stafford, Iron-master, for improvements in the manufacture of keel plates for vessels, iron gates, gate-posts, fences, and gratings.—Sealed June 30, 1842.

Michael Coupland, of Pond-yard, Park-street, Southwark, Millwright and Engineer, for improvements in furnaces.—Sealed June 30, 1842.

Thomas Banks, of Manchester, in the county of Lancaster, Engineer, for certain improvements in the construction of wheels to be employed upon railways.—Sealed July 5, 1842.

John Tresahar Jeffree, of Blackwall, in the county of Middlesex, Engineer, for certain improvements in lifting and forcing water and other fluids, parts of which improvements are applicable to steam-engines.—Sealed July 6, 1842.

James Nasmyth, of Patricroft, in the county of Lancaster, Engineer, for certain improvements in machinery

or apparatus for forging, stamping, and cutting iron and other substances.—Sealed July 7, 1842.

To Charles Augustus Preller, of Eastcheap, in the City of London, Merchant, for improvements in machinery for preparing, combing, and drawing wool and goats' hair. Communicated by a foreigner residing abroad.—Sealed July 13, 1842.

William Revell Vigers, of Russell-square, in the county of Middlesex, Esquire, for a mode of keeping the air in confined places in a pure or respirable state, to enable persons to remain or work under water and in other places without a constant supply of fresh atmospheric air. Communicated by a foreigner residing abroad.—Sealed July 13, 1842.

Gottlieb Boccius, of the New-road, Shepherd's-bush, in the county of Middlesex, Gentleman, for certain improvements in gas and on the methods in use, or burners for the combustion of gas.—Sealed July 14, 1842.

John Hall, of Breeze's-hill, Ratcliff-highway, in the county of Middlesex, Sugar Refiner, for improvements in the construction of boilers for generating steam.—Sealed July 18, 1842.

John Elliott Fox, of Finsbury-circus, in the City of London, Gentleman, for improvements in steam-engines. Communicated by a foreigner residing abroad.—Sealed July 18, 1842.

William Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, Civil Engineer, for certain improved machinery for excavating, dredging, and removing earthy and stony matters in the construction of railroads, canals, cleaning of rivers, harbours, and redeeming of marshy or alluvial soils; also for boring rocks, indurated clay, and other earthy matters, for the purpose of blasting and removing the same; the whole to be worked by steam and other power. Communicated by a foreigner residing abroad.—Sealed July 25, 1842.

LIST OF NEW PATENTS.

Thomas Bell, of St. Austel, Cornwall, Mine Agent, for improvements in the manufacture of copper.—Sealed July 29, 1842.—(*Six months.*)

Jules Lejeune, of North-place, Regent's Park, Engineer, for improvements in accelerating combustion, which improvements may be applied in place of the blowing machines now in use.—Sealed July 29, 1842.—(*Six months.*)

John Stephen Woolrich, of Birmingham, Chemist, for improvements in coating with metal the surface of articles formed of metal or metallic alloys.—Sealed August 1, 1842.—(*Six months.*)

Alfred John Phipps, of the Blackfriars-road, Gentleman, for certain improvements in paving streets, roads, and ways.—Sealed August 1, 1842.—(*Six months.*)

Joseph Whitworth, of Manchester, Engineer, for certain improvements in machinery or apparatus for cleaning roads, and which machinery is also applicable to other similar purposes.—Sealed August 2, 1842.—(*Six months.*)

John Dry, of Beverley, Agricultural Implement Maker, for certain improvements in thrashing machines.—Sealed August 2, 1842.—(*Six months.*)

Samuel Carson, of York-street, Covent-garden, Gentleman, for improvements in purifying and preserving animal substances.—Sealed August 3, 1842.—(*Six months.*)

Archibald Turner, of Leicester, Manufacturer, for improvements in the manufacture of muffs, tippets, ruffs, mantillas, cloaks, shawls, capes, pellerines, boas, cuffs, slippers, and shoes.—Sealed August 3, 1842.—(*Six months.*)

John Lee, of Weston-street, Bermondsey, Gentleman, for improvements in wheels and axletrees to be used on railways, and in machinery for stopping on, or preventing

such carriages from running off railways, which improvements may also be applied to other carriages and machinery.—Sealed August 3, 1842.—(*Six months.*)

CHARLES HENRI PERRIN, of George-yard, Lombard-street, London, for some improvements in the construction of certain parts of the mechanism used in watches and chronometers, which improvements are also applicable to some kinds of clocks.—Sealed August 8, 1842. —(*Six months.*)

DAVID NAPIER, of Millwall, Engineer, for improvements in steam-engines and steam-boilers.—Sealed August 9, 1842.—(*Six months.*)

THOMAS WALKER, of Birmingham, Stove Maker, for improvements in stoves.—Sealed August 9, 1842.—(*Six months.*)

RICHARD FORD STURGES, of Birmingham, Manufacturer, for a certain improvement in the manufacture of Britannia metal and plated wares.—Sealed August 10, 1842.—(*Six months.*)

DOMINIC FRICK ALBERT, of Cadishead, near Manchester, Doctor of Laws, Manufacturing Chemist, for a new combination of materials for the purpose of manufacturing a manuring powder.—Sealed August 10, 1842.— (*Six months.*)

MOSES POOLE, of Lincoln's-inn, Gentleman, for improvements in paving or covering roads and other ways. —Sealed August 11, 1842.—(*Six months*, being a commission.)

JOSEPH BETTELEY, of the Brunswick Anchor Works, Liverpool, Chain Cable Manufacturer, for improvements in windlasses and machinery for moving weights.—Sealed August 11, 1842.—(*Six months.*)

JOHN THOMAS BETTS, of Smithfield-bars, London, Gentleman, for improvements in covering and stopping the necks of bottles. Communicated by a foreigner residing abroad.—Sealed August 11, 1842.—(*Six months.*)

GEORGE ROBERTS, of Park-place-west, Liverpool-road,

Islington, Miner, for improvements in the construction of lamps.—Sealed August 15, 1842.—(*Six months.*)

William Raybould, of St. James's-walk, Clerkenwell, Brass Founder, for a new or improved soldering iron.—Sealed August 18, 1842.—(*Two months.*)

George John Newbery, of Cripplegate-buildings, London, Artist, for certain improvements in producing damask and other surfaces on leather and other fibrous substances and fabrics.—Sealed August 18, 1842.—(*Six months.*)

Nathan Defries, of 26, Grafton-street, Fitzroy-square, Engineer, and Nathaniel Fortescue Taylor, of Cleveland-street, Mile-end, Engineer, for improvements in meters for gas and other fluids.—Sealed August 18, 1842. —(*Six months.*)

William Ridgway, of Northwood, Stoke-upon-Trent, Earthenware Manufacturer, for a new method of conveying and distributing heat in ovens used by manufacturers of China and earthenware, and brick, tile, and quarry makers.—Sealed August 18, 1842.—(*Six months.*)

Goldsworthy Gurney, of Great George-street, Gentleman, for certain improvements in apparatus for producing, regulating, and dispersing light and heat.—Sealed August 18, 1842.—(*Six months.*)

Richard Else, of Gray's-inn, Esq., for certain improvements in machinery or apparatus for forcing and raising water and other fluids.—Sealed August 18, 1842. —(*Six months.*)

Thomas Hendry, of Glasgow, Mechanic, for certain improvements in machinery for preparing and combing wool and other fibrous materials.—Sealed August 25, 1842.—(*Six months.*)

David Redmund, of Charles-street, City-road, Engineer, for improvements in hinges or apparatus applicable to suspending or closing doors and gates, and other purposes.—Sealed August 25, 1842.—(*Six months.*)

Macintosh, Printer, Great New-street, London.

THE

REPERTORY

OF

PATENT INVENTIONS.

No. CVI. NEW SERIES.—OCTOBER, 1842.

Specification of the Patent granted to Francis Marx, *of No.* 81, *Eaton-square, in the County of Middlesex Esquire, for certain Improvements in the Construction of Ships or other Vessels, and the Method of Propelling them.*—Sealed December 16, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention of improvements in the construction of ships and the method of propelling them consists of three departments or things.

First, in the construction and form of the vessel.

Secondly, in the application thereto, or to vessels of common construction, of submerged propelling or paddle-wheels.

Thirdly, in the method of combining therewith or to any other paddle or propelling-wheel the steam-engine, and that part thereof called the waste-pipe, for the purpose of facilitating the condensation of the steam of said engine.

In constructing the vessel, I provide a curvilinear or arched deck, which I call a shield deck, to be faced with

iron, and which I form to an arch of any desirable curve, which facing shall form, with the direction of any missive discharged from cannon afloat, an angle of any desired degree, so that it may glance or throw off said missive. Said shield deck, in connexion with the hull or parts of the vessel, forms an air or water tight bulk-head, which may be divided into one or more compartments, and gives (by its displacing of water) a buoyance by which said vessel will float through said vulnerable parts of the vessel, or those parts above the line of said arch and its abutments be pierced or torn by shot so as to admit water. The steam-engine machinery and water wheels are placed below said shield deck, and every part of them below the water line so as to be out of the reach of shot, and the water wheels being from their position submerged, are relieved from the effect of the sea, and for the better elucidation of my said invention, I refer to the accompanying drawings, longitudinal elevation, sectional end view, and cross section, marked No. 1, and No. 2, representing a steam-vessel for harbour defence or other use, in which A, A, A, is the water line, B, B, B, B, the shield deck faced with iron and supported by wooden or metal beams or angle iron chains. The abutments of said shield deck are joined and secured entirely round the vessel in any convenient or suitable manner, and at any required distance below the water line, so as to be out of the reach of shot. The summit of said shield deck is in a line with the line of the keel and midship, and is elevated the same distance above the water line as its abutments are below it. The hatches or hatchway should be amidship in the summit of the shield deck, and fitted with water tight metal sides to travel or slide fore and aft, on or within the shield deck, at C, C. The abutments of the shield deck, at B, B, are in like manner below the water line, and by reason of their distance below it, out of the reach of shot, and the surface of the shield deck being faced with iron, forming with the direction of any

missive discharged from cannon afloat or otherwise, any desirable angle, and as such angle will cause said missive to be glanced or thrown off from said deck, that part of the vessel contained under the surface of said shield deck is protected from the effect of shot. Compare the displacement or space contained between the water line with that part of the inner surface of the vessel's side, and that part of the surface of the shield deck, at H, H, to that contained between the part of the water line and part of the surface of the shield deck, at K, K, K, drawing No. 1, and it will be seen that should the side be so pierced or torn by shot as to fill the first-named displacement or space, at H, H, with water, being all the water that can enter the vessel, will settle or be depressed proportionately to the weight of water contained in said space, leaving to the vessel the buoyancy occasioned by the greater displacement or space contained between K, K, K, less the weight of water, at H, H. The vessel cannot, therefore, be made to sink by the means aforesaid, and the steam-engine and machinery will be protected from ingress of water or shot. The water wheels of the vessel revolve horizontally under water; the wheels being cylinders or drums, M, to which paddles or floats are attached in any convenient manner. The wheels are placed in wheel cases or openings made in the sides of the vessel, and fitting the wheels as near as convenient. To avoid contact and friction, the water wheels should be made of metal, and consist of a hollow water tight drum, M, and floats, R. The wheels may be either fixed permanently or made to detach at pleasure, from a vertical shaft on and passing through the floor of the vessel into the wheel case or cases. In said floor, which may be made of timber or metal, in which a pedestal and stuffing boxes are placed, the first to support the wheel shafts in their position, and in which they also revolve, and the latter to exclude the water. The lower ends of said shaft, D, are in the shape of an inverted cone, or

bevelled with rounded ends, made of metal properly tempered, to diminish friction. The shaft end revolves in metal steps fixed in the bottom of the wheel openings or cases. The upper ends of said water wheel shafts connect to the steam-engine by a crank or wheel gearing. The middle parts, or drums, or cylinders, M, of the paddle-wheels are made hollow and water tight that they may be light and buoyant, so as to relieve their shafts from weight and friction, for which purpose some play should be allowed in fixing. When it is desirable to construct the paddle wheels so as to ship and unship, a circular ring of metal having a flange, and larger in diameter than the throw of the crank, should be bolted or secured to the floor over the wheel openings, embracing each water wheel shaft. On the flange is attached by screw-bolts and packing a cylinder, Q; reaching in height above the water line of the cylinder; Q, may be removed and placed out of the way when the operation of shipping and unshipping the water wheels is completed. The propelling wheels so fitted to ship and unship are attached to their shafts in the following manner, viz.:—In the drum, M, is a female screw with perpendicular grooves for the reception of keys, N, each of which is fitted with an eye-bolt on its upper end, so as to admit of their being drawn by an iron hook or otherwise, and rod, O, to the top of the cylinder, Q, above the water line and replaced in the same manner. The water wheel shafts have a male screw, P, to correspond and fit the screw in the water wheel at M, and the operation of shipping and unshipping said wheels is thus performed. The engine is detached from the wheels by removing the connecting rod, or by throwing out the wheel gearing, the cylinder, Q, is secured to its flange. The stuffing box is taken off, the pedestals are taken out, the shaft keys, N, are drawn, and the shafts are unscrewed and hoisted into the vessel through the cylinder, Q. The water wheels being detached, can readily be drawn from the wheel openings and hoisted

aboard, and another may be placed in the wheel opening; the paddle wheel will then rest on the bottom of the wheel opening. Let the shaft be lowered, and turn it till the end takes in its step, then till the wheel is clear of the bottom of the wheel opening, and then key it. Let the pedestals, which will nearly exclude the entrance of water, be put in, then pump the water out of the cylinder, Q, and whilst placing the stuffing box, turn a cock, which may be placed in the lower part of the cylinder, Q, through which any water passing the pedestals may run into the hold of the vessel, then detach the cylinder, Q, and remove it and connect the engine.

The nature of that part of my invention which relates to my improved method of using the high-pressure steam-engine, by which additional power may be obtained, and the noise commonly produced by the escapement of the steam in its passage from the cylinder is avoided or lessened, consists in making a communication by means of a pipe between and from the escape-pipe or opening of the cylinder, to the centre of the upper part of the propelling wheel-case, encompassing the submerged wheel so that the escaping steam be conducted within said case by the vacuum in part or in whole formed by the condensation of the steam at that place, and the centrifugal action given by the paddle wheel to the water contained within said wheel-case, which is made to condense the escaped steam; and for the better elucidation of this part of my invention, I refer to the accompanying drawing, marked No. 2, where one-half of the middle or cross section of a vessel with one paddle wheel and condensing-pipe or apparatus is represented, A, A, A, A, is one-half of the middle section of a vessel; B, B, the hollow cylinder or drum of the paddle wheel; *c*, *c*, the paddles or floats; D, the paddle wheel shaft; E, E, E, E, the case in which the paddle wheel revolves; F, F, F, F, F, the space between the paddle wheel and case; G, is the connecting-pipe or apparatus. The

escaping steam is made to condense and exhaust about the axis of the paddle wheel shaft, D, by means of the pipe, G, and the centrifugal action of the water caused by the paddle wheel induces frequent change of water in the pipe, G, and effects a partial vacuum within the escape-pipe and cylinder of the steam-engine, and the water contained within the case, E, E, E, E, E, condenses the escaping steam conducted to it through the pipe, G, or an air tight condensing cylinder may be placed over the exit passage, at G, the top of the cylinder standing above the water line, the pipe, G, terminating in it as at T. The condenser may be of any required dimensions; the water contained in it will present a refrigeratory surface. The centrifugal motion of the water in the wheel-case, caused by the action of the propelling wheel, will induce frequent change of water in the condensing cylinder.

I claim the application of shield decks to vessels constructed of metal or wood, whether propelled by steam power or any other power, and also the application of submerged propelling wheels upon the principle described in the aforegoing specification, whether placed vertically, horizontally, or obliquely, for the purpose of propelling vessels.

I also claim the method of using the steam-engine for the propulsion of vessels, by which the submerged propelling wheel-case or apparatus is made to serve as an exhauster or exhausting medium, and the water contained within the wheel-case, in which it revolves as a condenser, thereby conferring all the advantages of a condensing-engine with the lightness and simplicity of the high-pressure steam-engine, with also the noiseless action of the former.—In witness whereof, &c.

FRANCIS MARX.

Enrolled June 15, 1842.

Specification of the Patent granted to JOSEPH ATKINSON, *of Round-hill, near Masham, in the County of York, Farmer, for Improvements in Thrashing and Winnowing Machines.*—Sealed March 7, 1840.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My improvements in thrashing and winnowing machines consist in a novel arrangement of parts for effecting the operations of thrashing or separating corn from its straw, and also for winnowing or clearing it from its chaff and husks. The thrasher, or that part of the machine which strips or separates the grain from the ear and stalk, consists of a rotary drum or cylinder, furnished with any suitable number of spikes made of iron standing radially or nearly so round its periphery. This drum or cylinder is mounted in bearings fixed on the frame-work, and is partially enclosed or surrounded by a semi-cylindrical box or recess, the interior of which is also furnished with spikes standing in inclined positions.

Fig. 1, in the drawing hereunto annexed, represents a longitudinal section taken vertically through the middle of the machine.

Fig. 2, is a horizontal view, as it would appear when seen from above, some parts of the covering being removed to exhibit the interior.

Fig. 3, is an elevation or external side view, showing the manner in which the different parts are actuated by bands and toothed gear, and

Fig. 4, represents an end elevation of the machine, showing some of the internal parts, the same letters referring to similar parts in all the figures. *a*, *a*, is the drum armed with radial spikes, as before mentioned; *b*, *b*, is the semi-cylindrical recess by which the cylinder, *a*, is partially surrounded. The spikes fixed in this recess are

placed obliquely, as represented in the drawing, fig. 1. The wheat or other material to be thrashed is placed on the inclined plane, *c*, in front of the cylinder or drum, *a*, *a*, and is conducted or fed into the machine over the roller, *d*, which prevents the passage of stones. As the drum, *a*, *a*, revolves, the spikes which are fixed therein drag the wheat or other material forward into the space between the said drum and the recess, *b*, where the grain is beaten out or stripped, and separated from the ear by the action of the radial spikes of the revolving drum, the oblique spikes in the concave recess being placed sufficiently close to hold or retain the ear of corn during the operation of beating or stripping it. When this has been accomplished, the grain and chaff will fall down the inclined plane, *e*, on to the segmental sieve of wire-work, *f*, the meshes or openings of which are sufficiently large to allow of the grain and chaff passing through and falling down into the hopper, *g*, below. In passing through the opening at the bottom of the hopper, the chaff becomes separated from the grain by a current of wind, produced by the rotation of a rapidly revolving fan or blower, *h*, which drives the chaff and dust away through the opening in the bottom and back of the machine, the grain from its gravity falling down on to the inclined shoots, *i*, and *k*, as represented in the drawing, at fig. 1.

The straw, as it is brought down on to the sieve, *f*, by the action of the drum, *a*, is conducted or cleared out of the machine by an instrument which I denominate a rake. This rake consists of four arms, *l*, *l*, *l*, *l*, affixed to a revolving axle, *m*. The arms are formed by plates, *n*, *n*, *n*, *n*, the outer edge of each of which has a row of blunt teeth, seen in figs. 1, 2, and 4. As this rotary rake turns upon its axle in bearings, it rakes or throws out the straw at the opening, *p*, as seen in the drawing.

The working parts of the machine are all enclosed in a wooden casing, as seen at fig. 3, and the whole is mounted

on running wheels, *q, q, q, q,* for the purpose of removing the machine with facility from one situation to another. In figs. 3, and 4, *r,* is the shaft to which manual or other power must be applied to work the machine. Upon this shaft is mounted a cog-wheel, *s, s,* which gears into two pinions, *t,* and *v,* the pinion, *t,* being mounted on the axle of the drum, *a, a,* and the pinion, *v,* on the shaft or axle, *m,* of the revolving rake. The fan or blower for winnowing the corn is actuated by a band or strap, *u, u,* which communicates motion from the small band-wheel, *w,* on the axle of the drum, *a,* to the band-wheel, *x,* on the axle of the fan or blower.

Having thus described my improvements, and the manner in which the new constructed machine is to be used, I wish it to be understood that I claim as my invention, first, the drum with pegs or spikes on its periphery, or a series of arms or wheels with pegs or spikes (which might answer the same purpose), revolving within a segmental casing, furnished also with pegs or spikes, as shown in the drawing, or a series of bars or ribs furnished with pegs or spikes arranged in a suitable manner, for the purpose of separating the corn from its ear in passing through the machine, and also the adaptation and arrangement of the rotary rake and blowing apparatus, in connexion with the spiked drum and its segmental casing, for the purposes of thrashing and winnowing, as above stated.—In witness whereof, &c.

JOSEPH ATKINSON.

Enrolled September 7, 1840.

Specification of the Patent granted to EDWARD LAW, *of Downham-road, Kingsland, in the County of Middlesex, Gentleman, for certain Improvements in Evaporating Sea-water or other Fluids, and in the Manufacture of Salt.*—Sealed March 20, 1839.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—

My said invention is chiefly applicable to the evaporation of sea-water and other fluids containing a large portion of water, as the weaker salt springs, for instance, and which, at the present low price of salt, renders them inapplicable to the manufacture of that article.

Now, my improvements consist in the application of machinery, by means of which I can evaporate the water in a cheaper and more speedy manner than has hitherto been effected. This I perform by exposing the sea-water or other fluids on an extensive surface, to the action of a brisk current of atmospheric air, by means of horizontal machines, which can be easily turned and put into rapid circulation, or by means of the currents of air so produced.

In either of these ways I am able to evaporate a much greater quantity of water at a smaller expense, and in a lesser time than could be effected by any of the usual methods, and thereby to make salt from sea-water and the weaker salt springs, with economy and despatch. I can likewise evaporate other fluids containing large quantities of water with great advantage, by the use and application of similar means; and I do hereby claim this method of evaporating water or other fluids as a new principle, and likewise all its various applications. As, however, it is desirable to afford examples of carrying my said invention into effect, I shall proceed to do so by referring to the figures contained in the drawings which, as aforesaid, are annexed to this specification.

In drawing No. 1, fig. 1, A, A, represents an upright shaft or axis, carrying ten frames, B, B, B, B, B, B, B, B, B, B, as shown in the horizontal plan of it. Fig. 2, upon these frames, sheets, or wings, of strong canvass or other suitable materials, are affixed as shown on one side of fig. 1, at C. The sea-water or other fluid is dispersed all over the surfaces of the wings by means of pipes, D, D, fig. 1, and D, D, D, D, D, D, D, D, D, D, fig. 2, with holes on their undersides, which proceed from a central funnel, E, which is supplied by means of a pipe,

f, with a regulating cock, which descends from a pipe, G, G, connected with the tank or upper reservoir of sea-water or other fluid. The lower or bottom hardened steel pivot, H, fig. 1, of this upright shaft, A, A, is made flat underneath, and rests or is supported upon a convex or somewhat rounded surface of hardened steel, which is mounted in a cast-iron chair or oil reservoir, and which likewise has a cylindrical hole in its cover, accurately fitted to the cylindrical bottom pivot; and by this contrivance it turns with very little friction indeed, and is constantly lubricated with the oil contained in the cast-iron chair. In order to prevent the entrance of the sea-water or other fluid into the oil vessel, it is furnished with a hood or cover, in the manner shown. The upper or top pivot, I, of the upright shaft, A, A, is formed by means of a hardened steel cylindrical stem, which descends from the underside of the beam, J, J, to which it is affixed by means of screws into a cast-iron oil cup, K, mounted upon the upper end of the shaft, A, A, and having a cylindrical hole in its cover, which is accurately fitted to the cylindrical stem, I. Oil being put into the cup, the upper pivot thus formed is constantly lubricated, and indeed it is continually surrounded with oil. A swift motion may be given to this upright set of frames, either by means of a band and pulley, as shown, and which must be actuated by any of the well-known first movers of machinery, or by toothed wheelwork, or in any other fit and proper manner. I thus expose the sea-water or other fluid whilst descending the wings, C, C, &c.; and in a widely diffused state, to a rapid current of air, produced by their swift circular movement, and thereby effect a quick evaporation of the water contained therein. Nor is this all, for, having thus created a rapid current of air by the swift revolutions of the upright machine and its wings, I can avail myself thereof by placing around it upright frames, supporting hurdles or frames, covered with strong canvass or other suitable materials, and

arranged in the zig-zag manner shown at fig. 1, in drawing No. 2, at P, P, P, P, P, P, and thus the sea-water or other fluid thrown off by the centrifugal action from the wings in a partly concentrated state, will be again exposed to the action of a rapid current of air, and become still more concentrated. I can likewise pour fresh supplies of sea-water or other fluids down these fixed frames of hurdles or frames, covered with canvass or other suitable materials, with a very considerable evaporating effect produced as above, in addition to the sea-water or other fluid thrown off the revolving wings of the machine. I can likewise evaporate sea-water and other fluids in the manner shown in figs. 3 and 4, of the drawing No. 1, where the upright shaft or axis, A, A, is shown, in the manner of that shown in figs. 1 and 2; but instead of being furnished with frames and wings, it has several metal circular cupped discs, L, L, L, L, L, L, L, fig. 3, and, L, fig. 4, affixed upon it from top to botton, and which are also supported between upright standards, M, M, M, M, and upon arms, N, N, at the bottom of the shaft or axis, A, A. The outward rims of the discs, L, L, are turned inwards, as is shown. Holes are made in all these discs at corresponding distances apart in each, as shown in fig. 4; and through these holes cords, lines, or ropes are passed from bottom to top, and either in a circular order, as is generally shown, or in radial lines, as in those shown at O, in fig. 4. These cords, lines, or ropes must be well secured above and below. The sea-water or other fluid to be evaporated is to be delivered into the uppermost disc, L, fig. 3, by the pipes, P, P, which descend from the main pipe, G, G, and enter a horizontal pipe, Q, which has holes made along it, and disperses the sea-water or other fluid all over the upper disc, when it is rapidly turned beneath it, and is passed through the holes made in all the discs, and down all the cords, lines, or ropes, to the bottom, all the while exposed to the evaporating action of the atmospheric air in its passage, and which is greatly increased by the rapid

movement of the cords, lines, or ropes through it, and passes off below in a greatly concentrated state. This machine does not indeed produce a rapid circulation of the air surrounding it in an equal degree with the machine described, in reference to figs. 1 and 2; but then it can be moved with less power than is requisite to actuate that machine. In either of the machines, should the sea-water or other fluid not be sufficiently concentrated on passing down them once, it will be received in the channel, R, and conveyed to a reservoir, from whence it may be raised by a pump or otherwise, to an upper reservoir, and then again be subjected to the evaporating action of the machines, as often as is found necessary to bring it to a proper state of condensation to be conveyed into the boilers or evaporating pans of the salt-works.

Having thus described the nature of my said invention and several modes of carrying the same into effect, I hereby declare that my improvements consist in exposing sea-water or other fluids, in a state of extended diffusion, to the action of currents of atmospheric air, produced by mechanical action, and in the methods herein shown and described.—In witness whereof, &c.

EDWARD LAW.

Enrolled September 20, 1839.

Specification of the Patent granted to JOHN PETER BOOTH, *late of Hatton-garden, in the City of London, but now of the City of Cork, in the Kingdom of Ireland, Feather Merchant, for certain Improvements in the Manufacture of a Substantial or Compound Fabric, which will be applicable to the making of Quilts, Coverlets, and Wadding, for Purposes of Clothing or Furniture.*—Sealed December 7, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.

My invention of improvements in the manufacture of quilts, coverlets, and wadding, for purposes of clothing and furniture, consists in the application of down thereto, in the manner hereinafter described. This down may be obtained from any bird or animal; but I use in preference the down obtained from goose feathers. After the down is properly dressed and prepared, in any of the methods usually adopted for such purposes, I arrange it in a layer of a convenient thickness, and place it within a case or covering, consisting of two sheets of any suitable material. When the down is properly placed and arranged in this case or covering, it is retained there, and in its proper situation, by stitching or quilting the case or covering in the manner shown in the drawing hereunto annexed, which represents a plan and side view of one of my improved quilts or coverlets, without the outer case or covering. After the down is properly secured in the manner above described, or in any other convenient manner, within its inner case or covering, the quilts, coverlets, or wadding thus produced may be covered with any ornamental fabric, such as satin, silk, velvet, chintz, or other material, according to the purpose to which my improved wadding is intended to be applied.

It will be evident from the foregoing description, that my invention may be employed for every purpose in which warmth is required, and also, as before mentioned, it may be inclosed within an ornamental covering of any description, from which it may be removed with the greatest facility, without at all injuring either the quilt or wadding, or the ornamental case or covering.

Another advantage is that by securing the down or wadding in an inner case, the down is prevented from working through the ornamental covering.

Having now described my invention, and the manner in which the same is carried into effect, I wish it to be understood, that I claim as the invention secured to me by the hereinbefore in part recited letters patent,

First, the application of goose down under two covers; the inner cover is to be quilted or otherwise secured, and the outer or ornamental cover stitched or connected to the inner, in any convenient manner, for the purpose of making quilts, coverlets, or other similar articles of furniture, as above described. And

Secondly, I claim the application of down of every description, to be applied in the manner above explained, to every purpose of clothing where warmth is required, as an improved material for, or mode of, wadding garments.—In witness whereof, &c.

JOHN PETER BOOTH.

Enrolled May 7, 1842.

Specification of the Patent granted to MICHAEL COUPLAND, *of Pond-yard, Park-street, Southwark, Millwright, for Improvements in Furnaces.*—Sealed September 4, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—I do hereby declare that the nature of my said invention, which relates to that class of furnaces where the fuel is supplied from below the fire upwards, consists in causing a portion of the open fire-bars to descend to receive fresh supplies of fuel, as occasion may require, leaving a portion of the fire on the remaining fixed portion of the open fire-bars above, while the portion of the open fire-bars which descend to receive the said fresh supplies of fuel having been supplied, is raised again to its former position; by this means the fuel which is on the moveable or descending part of the open fire-bars (while such open fire-bars are up in their proper position), will have a full supply of atmospheric air supplied thereto, in place of

the surface which raises up the fresh fuel, being a close surface, or platform or piston, such as has heretofore been used or proposed to be used, through which no air could pass to the fuel above such close surface heretofore used, tending materially to prevent the combustion of the fuel placed thereon, in consequence of not allowing the requisite passage of air to the fuel; hence the principle of feeding furnaces from below upwards, which has been many years well known, has not come into general use.

Now, my invention, as before stated, has for its object the raising fuel from below the fire upwards into the fire, by means of part of the open fire-bars being made capable of descending and ascending while in a horizontal position, and when such part of the open fire-bars is in its place, to allow of a free passage of atmospheric air to the fuel above, by which means great improvements will be obtained in furnaces made on the principle of being fed with fuel from below upwards.

And in further compliance with the said proviso, I, the said Michael Coupland, do hereby describe the manner in which my said invention is to be performed, by the following statement thereof, reference being had to the drawing annexed, and to the figures and letters marked thereon (that is to say):—

Description of the Drawing.

Fig. 1, represents the longitudinal section of a furnace applied to a steam-engine boiler; but furnaces having my improvements applied thereto, may, as a matter of course, be applied to other boilers and other uses.

Fig. 2, is a plan of the open fire-bars, with what I call the lifting bars and other apparatus connected therewith.

Fig. 3, shows a plan of the lifting bars, which are caused to ascend, and to bring down the moveable part of the open fire-bars to receive the fresh supplies of fuel as required, and bring them up into the fire; and

Fig. 4, shows a transverse section of fig. 1. In each of

these figures similar letters indicate similar parts. *a*, *a*, are the open fire-bars, which are caused to move up and down, and to fill up the space between the fixed fire-bars, *b*, *b*. The bars, *a*, *a*, are combined together by the transverse bars, a^1, a^1, a^1, a^1, and when up in their places, they are retained secure by means of the bolts, *c*, *c*, which enter holes formed in the two end transverse bars, a^1, a^1, as is shown; and in order to allow of the open fire-bars, marked *a*, *a*, descending, the bolts, *c*, *c*, are withdrawn, as will be hereafter explained. *d*, is a wheel (with several handles, d^1), affixed to the axis, *e*; this axis turns in suitable bearings at *f*, *f*, and has a bevilled-toothed wheel, *g*, affixed thereto: this wheel works into and drives the bevilled pinion, *h*, which is affixed to the axis, *i*: this axis has two screws formed thereon at i^1, i^2, which are cut in opposite directions, and the axis, *i*, turns in suitable bearings, *j*, j^1. On the screws of the axis, *i*, are applied the two blocks, *k*, with female screws formed through them; to each of the blocks, *k*, are attached connecting-links, *l*, *l*, by means of pin-joints, the other ends of the connecting-links being attached by pin-joints to the under part of the lifting-bars, *m*, which lifting-bars, *m*, are so arranged as to interspace the open fire-bars, *a*, by which means, when the lifting-bars, *m*, are in action, they will keep the open fire-bars, *a*, *a*, from sliding sideways or endways out of their proper position, while in the act of ascending or descending, and the raising of the lifting-bars, *m*, *m*, will be accomplished by causing the axis, *i*, to revolve in a direction to cause the screw-blocks, *k*, to approach each other, and when the lifting-bars, *m*, are thus raised high enough to interspace with the open fire-bars, *a*, *a*, they may be released by withdrawing the bolts, *c*, in the following manner:—*n*, is a handle attached by a pin-joint to the lever, *o*, such lever having two of the bolts, *c*, thereon. Those bolts will be withdrawn when the handle, *n*, is drawn outwards. *p*, is a connecting-rod, which connects the lever, *o*, and the lever, *q*, as is

shown; and one end of the lever, *q*, being the other bolt, *c*, it will follow, that when the bolts, *c*, *c*, at the front end are withdrawn, the bolt, *c*, at the front will be removed out of the way, and the open fire-bars, *a*, *a*, allowed to descend with the lifting-bars, *m*, which is accomplished by reversing the direction in which the axis or shaft, *i*, is caused to turn. The apparatus will now be in a position for receiving fresh supplies of fuel on to the descending portion of the open fire-bars, *a*, *a*, while a portion of the fire above is still sustained by the fixed side fire-bars, *b*, *b*. The fresh supply of fuel being placed on to the open fire-bars, *a*, *a*, those bars are to be raised up into their places by means of the lifting-bars, *m*, and when the open fire-bars, *a*, *a*, are again raised up, they are secured in their places by the bolts, *c*, which are forced into the end transverse bars, *a*, by means of the handle, *n*, and apparatus worked thereby, and then the lifting-bars, *m*, are to be immediately lowered out of the way so as to allow the atmospheric air to pass freely through to the fuel on the open fire-bars, *a*, *a*, and thus an uniform set of open fire-bars will be preserved over the whole surface of the bottom of the furnace for the burning fuel to rest upon; and it will be evident that the rising and falling bars, *m*, *m*, which I have called lifting-bars, simply act to raise and lower the open fire-bars, *a*, *a*, and are not used in any way for supporting the fuel, such lifting-bars, *m*, being intended only to raise the open fire-bars which do support the fuel, into a proper position, and then to be removed in order to allow of the atmospheric air passing between the said open fire-bars, *a*, *a*, which they have so raised as aforesaid. In some cases where the space filled up by the open fire-bars, *a*, *a*, is too wide for the fuel to sustain itself across from the fixed side-bars, *b*, to *b*, when the open fire-bars, *a*, have descended, I apply a series of bars, *r*, *r*, to be forced across the opening, as is indicated by dotted lines in fig. 4; but I make no claim to such means of giving temporary support to the fuel in the

absence of the open fire-bars, *a, a,* similar bars having been before used for that purpose. I have not thought it necessary to describe the construction of the other parts of the furnace, as they form no part of my invention, and they are clearly shown in the drawing.

Now whereas it is evident that a descending cross grating, open lattice, or extensively perforated plate might be substituted for what I have called my descending open fire-bars, *a, a :* For I would have it understood that I do not confine myself to the precise form of descending open fire-bars hereinbefore described; but claim as my invention the lowering, at pleasure, and in a horizontal position, by any suitable apparatus (though I prefer that hereinbefore described), a portion of the open fire-bars of a furnace, to a position sufficiently below the fire to enable a fresh supply of fuel to be placed thereon, and then raising them again to their former position in the furnaces, and retaining them there till the fuel is consumed, and a fresh supply required, without interfering with the draft necessary for the combustion of the said fuel while being so consumed, as aforesaid, and thereby I am enabled to do away with all feeders, hoppers, pushers, plungers, pistons, inclined planes, and other the like objectionable apparatus, which have heretofore impeded the successful application of inventions for feeding furnaces from below upwards:

And such my invention being to the best of my knowledge and belief entirely new, and never before used within that part of Her said Majesty's United Kingdom of Great Britain and Ireland called England, her said dominion of Wales, and town of Berwick-upon-Tweed, I do hereby declare this to be my specification of the same, and that I do verily believe that my said specification doth comply in all respects fully and without reserve or disguise, with the proviso in the said hereinbefore in part recited letters patent contained: Wherefore I do

hereby claim to maintain exclusive right and privilege to my said invention.—In witness whereof, &c.

MICHAEL COUPLAND.

Enrolled March 4, 1842.

Specification of the Patent granted to WILLIAM PROWETT, *of Northamptonshire, Victualler, for Improvements in giving Signals on Railways.*—Sealed December 16, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention has for its object a mode of communicating to the engineer or other person travelling with an engine, or with a train of carriages, when a preceding train or engine has only lately passed, and thus give timely information, and allow of the train being retarded or stopped as the occasion may require, and the apparatus employed is such that one train having passed along the line shall so act on that part of the apparatus which is affixed on the line of railway, as to move a bar into a position which will cause it to stand in the way of part of other apparatus of the tender or other carriage of a train, and according as the time is longer or shorter since the previous train has passed so will be the indication given, and if the previous train has passed sometime before, the projected bar or instrument will have moved out of the way, and no action will take place on the apparatus of the passing train, but such passing train will again set the apparatus into a position to give a signal to the next coming train, should the time of its coming be so short as to render it desirable to retard or stop the progress. And in order that my invention may be most fully under-

stood and readily carried into effect, I will proceed to describe the drawing hereunto annexed.

Description of the Drawing.

Fig. 1, represents a locomotive engine and tender on a railway, and also the apparatus affixed at intervals on railways.

Fig. 2, shows the tender only, just in the act of setting the apparatus in motion.

Fig. 3, shows a back view of the engine, the apparatus carried by which is being acted on by the apparatus affixed on the railway.

Figs. 4, and 5, show two sections separately of the apparatus affixed at intervals on a railway, such sections being on a larger scale in order that the parts may be seen more clearly.

Figs. 6, 7, 8, 9, and 10, show various views of parts of the apparatus applied to the locomotive engine or other carriage of the train. In all these figures the same letters indicate similar parts. On the tender is applied an inclined plane, *a*, *a*, which coming in contact with the apparatus hereafter explained, will set it, as hereafter described. *b*, is a projecting arm, which is affixed to the axis, *c*, which axis has a pulley, *d*, affixed thereon, and by means of a weighted chain, *e*, the projection, *b*, is kept at all times in a perpendicular position when not acted on by the passing inclined plane, *a*, *a*. On the pulley, *d*, is a tooth, *f*, which coming in contact with the tooth, *g*, affixed on the cog-wheel, *h*, causes that cog-wheel to move partly round, the cog-wheel otherwise moving freely on the axis, *c*. The cog-wheel, *h*, takes into and drives the pinion, *i*, affixed on the axis, *j*, and on the axis, *j*, is affixed the pulley, *k*, on which the chain, *l*, is wound, the other end of the chain being affixed to the bar, *m*, so that when the axis, *j*, is turned round the bar, *m*, will be raised into its highest position, as is shown at fig. 5. On the axis, *j*, is affixed a cog-wheel, *n*, which takes into and

drives the pinion, *o*, affixed on the axis, *p*, and on such axis, *p*, is also affixed the cog-wheel, *q*, which takes into and gives motion to the pinion, *r*, affixed on the axis, *s*, and on the axis, *s*, is affixed the escapement-wheel, *t*, all which, with the escapement, will readily be understood in the drawing. The passing of the inclined surface, *a*, against the projection, *b*, gives motion to the train of wheels, and raises the bar, *m*, to its highest position, and so soon as the inclined plane has passed away, the weight of the bar, *m*, will cause it to descend as fast as the escapement will permit, and, according as the time is longer or shorter since the last passing train, so will be the position of the bar, *m*, and it will act against the parts of apparatus attached to the locomotive engine accordingly. *z*, *z*, is a frame with five slides, 1, 2, 3, 4, and 5, each slide having its lever, *v*, moving on an axis, *w*, and in each slide is cut a slot, through which a projecting stud, *x*, works; hence, when the lever, *v*, of either of the slides, 1, 2, 3, 4, or 5, comes against the bar, *m*, the slide will be projected out, and on its upper surface is to be marked the number of minutes since the previous train passed. Thus, supposing the train of wheels to be so arranged that the bar, *m*, shall fall a distance equal to the distance between one lever, *v*, and another lever, *v*, say in two minutes, the consequence would be that supposing the previous train had passed the apparatus ten minutes, the bar, *m*, would have descended out of the way of all the levers, *v*, and the train would pass onwards without any signal being given, but if the lower lever, *v*, only acted against the bar, *m*, the lower slide would be forced out, and would indicate that the previous train had passed more than eight minutes before and less than ten minutes, and if all the levers, *v*, acted against the bar, *m*, it would indicate that the previous train had passed less than two minutes before, and the engineer would act accordingly; and the various slides should be marked on their upper surfaces with numbers or other signs to indi-

cate the quantity of time, and the engineer, by having a light at all times near the slides, will readily see what is the nature of the signal given, whether by night or day, in open roadway or in a tunnel; and in order to ensure his attending at proper times to the signals so given, the lower of the slides protrudes out beyond the opposite end to that whereon the number is marked, and on such slide a weight, *y*, is supported, which is attached to a whistle, so that when the lower slide is moved by its lever, *v*, coming against the bar, *m*, the weight will fall and open the whistle, and give notice to the engineer; or there may be a bell or other instrument in connexion with the apparatus in place of a whistle. The apparatus may be affixed to the line of railway at any determined intervals, but the more often the better, to ensure the succeeding trains not coming too close to the preceding ones. I would remark, that although I have been thus particular in showing and describing the various parts, I do not confine myself to the precise details, so long as the mode above described of one train acting on an apparatus fixed at intervals to set it, so as to put in action other apparatus of a coming train, in such manner as to indicate the time since the previous train has passed, be retained. And I would have it understood, that I make no claim to the separate parts of the apparatus above described, but what I claim is the mode of giving signals to passing trains of the time since the previous train has passed.—In witness whereof, &c. WILLIAM PROWETT.

Enrolled June 16, 1842.

Specification of the Patent granted to THOMAS FULLER, *of the City of Bath, Coachmaker, for Improvements in retarding the Progress of Carriages under certain circumstances.*—Sealed July 7, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—

My invention of improvements in retarding the progress of carriages under certain circumstances, consists in the construction and adaptation to carriages of a novel or improved apparatus to act as a drag, whereby the progress of the carriage may be retarded when going down hill without stopping, and afterwards the drag may be disengaged from its holding position when it has arrived at the bottom of the hill, also without interrupting the progress of the carriage, the apparatus being enabled to be brought back into its original quiescent position, ready to come into operation a second time by its peculiar construction and that of its appendages, in consequence of which considerable time is saved in travelling, and the horses not so much strained as when they are subjected to frequent stoppages for placing and displacing any of the ordinary drags, such stoppages being particularly objectionable in coming down hills, the carriage having by its descent acquired some momentum. It is obvious, that if the drag can be disengaged without stopping the carriage, the momentum gained in descending the hill will considerably assist the horses for some distance along the level ground or in ascending a contiguous hill, and the time required for stopping and backing the carriage (as is the case in order to disengage ordinary drags), is by my improvement totally saved to the traveller, for, from the momentum gained in descending the hill, the carriage will run on a considerable distance with but little exertion from the horses. In the accompanying drawings,

Fig. 1, represents a side elevation of a cab-phaeton, two of the wheels being removed in order to prevent confusion, and show the dragging or retarding apparatus more distinctly. In this fig. the drag is represented as it would appear when in use

Fig. 2, is an end view of the hind pair of wheels and their axletree, showing the manner of attaching the drag to the hinder axle of the carriage. And

Fig. 3, is a side elevation of the carriage, with the wheels removed as in fig. 1, the drag being shown as it would appear when out of use; similar letters of reference denote corresponding parts in all the figures. The improved carriage-drag (shown in figs. 1, 2, 3, and 4), is not intended to be applied to either of the wheels, and has no connexion whatever with them, but when brought into operation it is lowered by means of a strap, and allowed to come into contact with the ground under the axletree to which it is attached, and immediately it touches the ground it acts as a crutch to the axletree, raising it and holding it up in the position shown in fig. 2, until disengaged by releasing the tension of the drag-chain, as will be hereafter described. The skid-shoe or drag-iron, *a*, *a*, is connected by joints to pendant levers, *b*, *b*, and the reverse end of the levers by other joints to bars, *c*, *c*, which are firmly attached by clips to the hind axletree, *d*, the skid-shoe or drag-iron, *a*, is retained in its proper place whilst dragging (as in fig. 1), by means of the drag-chain, *e*, one end of which is attached to the drag-iron or skid, and the other end to a tumbling lever, *f*. A front view of this tumbling lever, *f*, is shown detached at fig. 4. This lever is fixed to a short shaft, *g*, mounted in bracket-arms or bearings, *h*, *h*, attached to the under part of the carriage, and to the other end of the shaft, *g*, there is also attached a similar lever, *i*, but in an opposite position to the former. The lever, *i*, is attached at its upper end by a joint to a curved rod, *j*, which rod is also connected in a similar manner to the tail of a bent lever, *k*, *k*, which turns on a fulcrum pivot, *l*, fixed to the framing of the carriage. When the drag is not in use the skid-iron, *a*, and chain, *e*, are drawn up and suspended under the carriage in the positions shown in fig. 3, by means of a strap or cord, *m*, *m*, *m*, passed over and under carrier-pullies, *n*, *n*, *n*, the upper end of the strap having two rings or hooks, by which it is held upon two pins or studs, as at *o*, and *p*, in figs. 1, and 3. When the drag is

required to be brought into operation, the ring, *o*, on the strap or cord, *m*, must be taken off its holding stud or pin, and the levers, *b*, carrying the drag-iron, *a*, be allowed to fall, by which the skid will be brought to the ground. The progress of the carriage immediately brings the levers, *b*, *b*, into a straight line with the stationary arms, *c*, *c*, as represented in fig. 1, and as the length of the arms, *c*, *c*, the pendant-levers, *b*, *b*, and the thickness of the drag-iron, *a*, together amount to rather more than the radius of the wheel, the axletree to which this apparatus is attached becomes slightly raised at one end, thereby lifting one of the running wheels off the ground. By these means the weight of that side of the carriage becomes now supported by the arms *c*, *c*, and pendant-levers, *b*, *b*, and skid, *a*, as represented at fig. 2, and the carriage is immediately dragged.

In order to release the drag from its holding position on the ground, it is necessary to slacken the tension of the drag-chain, *e*, sufficiently to allow the drag to pass into the position shown by dots in fig. 1, on doing which the wheel will immediately come into contact with the ground and commence revolving again. To effect this object the lever, *k*, must be released from the spring-catch which holds it by touching the handle, *g*, and when so released the lever, *k*, immediately flies back, and assumes the position shown by dots in fig. 1. By the connexion of this lever, *k*, with the tumbling levers, *f*, and *i*, above described, the tumbling levers are made to turn on their axis and assume the horizontal position shown by dots, thereby slackening the drag-chain and allowing the skid-iron to pass behind, as shown in the figure. Then in order to bring the apparatus into its original position, as in fig. 3, to be ready for operation again, the driver or person on the box has only to pull the strap or cord, *m*, *m*, *m*, and hook the lower ring into the stud, *o*, and the drag-iron will be drawn over into the position shown in the last mentioned figure, when the

lever, *k*, must be replaced in its former situation. The skid-iron in its revolution has described the circle shown by dots in both figures, the peculiar shape and arrangement of the pendant-levers, *b*, *b*, and rods, *c*, *c*, as represented in fig. 2, allowing the skid-iron to swing through between them.

Figs. 5, 6, 7, 8, represent a modification of the above described apparatus, in which a skid-shoe in place of the drag-iron is applied to the wheel as in ordinary drags. The skid or shoe is lowered when required for use, and released and brought again into its original position in a similar manner to that of the apparatus above described; it will, therefore, only be necessary to explain such parts as differ in construction from the apparatus shown in figs. 1, 2, 3, and 4.

Fig. 5, represents an end elevation of a pair of wheels and their axletree, with the apparatus attached thereto, the skid-shoe being applied to one of the wheels as in the act of dragging.

Fig. 6, represents a horizontal view of the apparatus in the same position as in fig. 5, the wheels and part of axle being removed in order to exhibit the apparatus more distinctly. The skid-shoe or drag-iron is shown at *a*, *a*, attached at one end of the drag-chain, *e*, *e*, as in the other figures. The skid, *a*, is also connected by a joint to a bent arm or lever, *b*, which turns upon a centre pin fixed near the end of the stationary arm, *c*, (as seen in fig. 7,) which arm, *c*, is firmly affixed to the axletree by clips, as shown in the drawing. The bent lever, *b*, has a lateral branch or arm, *r*, extending from its side, having at its end an upright pin, *s*, to which a strap, *m*, *m*, is connected; this strap, *m*, passes over a carrier pulley, *n*, attached to the under side of the carriage at any convenient part. When the apparatus is not in use, it is held up or suspended by means of the strap, *m*, in the position represented in the horizontal view, fig. 8, and when required to be brought into operation the skid is lowered

by loosening the strap, *m*, as in the former case, its own gravity bringing it down under the wheel, where it is retained by the drag-chain as before, until the latter is slackened in the manner described, in reference to figs. 1, 2, 3, and 4, when the drag immediately passes behind the wheel and is raised into its original position by pulling the cord or strap, *m*, which makes it describe an oblique circle, as shown in figs. 6, 7, and 8, by dotted lines, the skid-iron in its revolution having passed over the carrier pulley, *n*, as seen in fig. 7. Immediately that the skid-iron attains its greatest altitude, it is drawn over the dead point by the weight of the chain, *e*, and being also aided by its own gravity, the skid-iron falls into the position shown in fig. 8, where it is held up or retained by the strap or cord, *m*, as before mentioned, until again required to be brought into operation.

Having now described my invention, and the manner in which the same is to be performed, I wish it to be understood that I do not intend to confine myself to the precise form, position, or arrangement of the parts herein shown, as the apparatus might, perhaps, be varied in some particulars to suit different circumstances, without departing from the principle of my improvements in carriage-drags, I therefore claim as the invention secured to me by the hereinbefore in part recited letters patent, the construction of apparatus as above described, whereby a drag may be released and brought into its original quiescent position by the driver or any other person without stopping or arresting the progress of the carriage, for the purpose of saving time in travelling and preventing the horses being strained, as frequently occurs from stoppages in using the ordinary drags.—In witness whereof, &c.

THOMAS FULLER.

Enrolled January 7, 1842.

Specification of the Patent granted to JOSEPH COOKE GRANT, *of Stamford, in the County of Lincoln, Ironmonger and Agricultural Implement Maker, for Improvements in Horse-rakes and Hoes.*—Sealed September 8, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—I do hereby declare that the nature of my said invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following statement thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon (that is to say) :—

Description of the Drawing.

Fig. 1, represents a side view of a horse-rake, constructed according to my invention. The teeth or tines being in a working position.

Fig. 2, shows a section, the teeth or tines being shown raised up out of action, in order to the rake being moved from place to place without the tines or teeth coming to the ground. And

Fig. 3, shows a plan of the parts in the positions shown in fig. 1; in each of these figures the same letters indicate similar parts. *a*, *a*, are two wheels moving on the axis, *b*, *b*, and the axis, *b*, *b*, are affixed to the bearings, *c*, *c*, which are affixed to the quadrangular framing, *d*, *d*. To the front of the framing, *d*, *d*, the shafts, *e*, *e*, for the horse are attached, as is shown. *f*, *f*, *f*, are a series of arms moving on an axis, *g*, and it will be seen that each of these arms, *f*, is affixed in a cast-iron socket, *h*, the nature of which is clearly shown, and in consequence of the portion of the

arm which enters the socket being formed in a lathe, and the casting of the socket being cylindrical, or nearly so, the ends of the arms are readily made to fit tight into the sockets, and by means of screws or pins, passed through the sockets into the arms, the arms are held secure; and such mode of constructing sockets to the arms, *f*, of horse-rakes, will be found an important improvement in the construction of horse-rakes, as the arms will work more freely on their axis, *g*, in all states of weather, and be more lasting than when the arms are made of wood, having each a hole through for the passage of their axis. *i*, *i*, *i*, are the teeth or tines of the rake, which are affixed to the arms, *f*, *f*; and it will be seen that each tine, from the point, i^1, to the point, i^2, is made of a continued curve, which is important, for by such means, when the arms and tines are lifted, they will at once deliver the hay, straw, or other matter which has been collected, in place of requiring to be repeatedly shaken, as heretofore. Hence this shape of teeth or tines, when combined with independent arms, *f*, *f*, moving on an axis, will be found an improvement over the present construction of horse-rakes, where the tines are separate and independent of each other, and where the tines, as heretofore made, are for the greater part of their length formed straight, the lower or pointed end being bent forward, producing a hooked end to a straight stem, which arrangement tends to raise or hook up the collected hay or other matters raked together, in consequence of its resting against the straight stems of the tines when the tines are raised; but by having the working parts of the tines of a continued curve, so that the tines in being raised pass out freely from the accumulation of hay or other matter, without having any tendency to raise the same, will be found a very great improvement in working horse-rakes.

I would here remark, that I am aware that the tines or teeth of hand-rakes which are all fixed on one bar, and do not move on an axis, have before been made of a

curved figure, I wish it therefore to be understood, that I do not claim generally to use curved teeth or tines to rakes, but only when they are combined with independent arms moving on an axis, and suitably arranged with wheels for a horse-rake. Each of the arms, *f*, *f*, is connected with a bar, *j*, by means of a chain or other convenient means, allowing the arms, *f*, *f*, to have a freedom of action independent of each other. The bar, *j*, is affixed to the arms, *k*, which move on axes at *l*, *l*, supported by the frames, *m*, *m*, affixed to the framing, *d*, as is shown, and the arms, *k*, proceed beyond their axes of motion, and form levers to raise and lower the bar, *j*; and consequently the teeth or tines, *n*, *n*, are connecting-rods or links which connect the levers, *k*, with the levers, *o*, the form of which is shown in the drawing, such levers moving on axes at o^1, o^1, at the front part of the framing, *d*; hence it will readily be seen that the lifting of the tines depends on a lever action produced by combining the levers, *k*, and *o*. By this arrangement the person attending the machine will readily discharge the collected hay or other matter from the tines of the rake by simply depressing the back end of the lever, *o*; and this operation may be quickly performed, and without stopping the horse; and very little power or force is required so as to lift the tines. *p*, *p*, are props or supports affixed to the frame, *d*, *d*, in order to support the bar, *j*, when the tines or teeth of the rake are in action; and, *q*, *q*, are catches moving on axes at q^1; by means of these catches the bar, *j*, and consequently the teeth or tines, can be kept out of action, as shown in fig. 2.

I would remark, that heretofore in constructing horse-rakes, the bar, *j*, to which the arms, *f*, are attached, has been raised by means of handles, which the person attending the machine raises upwards with his hands, carrying up the tines or teeth, which was an inconvenient motion, and requires much power; and it will be seen that by connecting the bar, *j*, with the lever, *o*, in such

manner that that lever acts by being depressed, the attendant will have command over the tines or teeth, and work them with more facility. And although I prefer the combined arrangement of lever action shown, and for it to work in the direction above described, the same may be varied, so long as the mode of raising the tines by depressing the back end of the lever be retained, or so long as a combining of two levers be resorted to for such purpose. And it will be evident that in place of having the lever, *o*, to move on an axis at one end, as is shown and described, it may have its axis at a point intermediate of its length, having a suitable bearing raised up from the framing, *d*, *d*, to carry the axis; in such the front end (the end of the lever towards the front of the machine) of the lever, *o*, might consequently be attached to the bar, *j*, by a chain passing over an eccentric or eccentrics affixed to the axis worked by the lever.

I will now describe that part of my invention which relates to horse-hoes, such machine being for the most part constructed as above described, in respect to figs. 1, 2, and 3, and the improvements in such horse-hoes consist of the application of the combined action of the parts, *o*, *n*, *k*, to lift a bar, *j*, connected to arms *f*, *f*, as above explained, such arms, *f*, having in place of the tines or teeth shown as applied thereto, suitable cutters or hoes formed on the ends of such tines or teeth; but it is not necessary that the stems of the hoes should be bent into the form shown, as those proper for the tines or teeth of horse-rakes, as such stems may be straight or bent, and the distance apart of the arms will be varied so as to place the holes further apart than the tines shown in the drawing; and the arms, *f*, may each have a weight when the land to be hoed requires it.

I would remark, in respect to this part of my invention, that I am aware that horse-hoes have before been made having each of the levers on an independent arm, and capable of being lifted by means of a simple lever.

Having thus described the nature of my invention, and the manner of performing the same, I would have it understood, that what I claim is,

First, the mode of connecting the arms, *f*, of horse-rakes with their axis, *g*, by applying the construction of cast-iron sockets, *h*, as above shown and described.

Secondly, I claim the combining the independent arms, *f*, *f*, of horse-rakes with curved tines or teeth, *i*, as above described.

Thirdly, I claim the application of the combined action of two levers, *o*, *k*, working on different axes, in connexion with a bar, *j*, to facilitate the lifting of the tines or teeth of horse-rakes.

Fourthly, I claim the application of a lever, *o*, to horse-rakes, when so connected with the bar, *j*, for so raising the tines or teeth, as to require the lever, *o*, to be depressed, in order to lift the tines or teeth, as above described. And,

Fifthly, I claim the mode of applying the compound lever action, *o*, *n*, *k*, to the bars, *j*, of a horse-hoe, having independent arms, *f*, *f*, as above described.—In witness whereof, &c.

JOSEPH COOKE GRANT.

Enrolled March 8, 1842.

Specification of the Patent granted to ROBERT WORNUM, *of Store-street, Bedford-square, in the County of Middlesex, Piano-forte-maker, for Improvements in the Action of Piano-fortes.*—Sealed February 15, 1842.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.— My invention relates,

First, to a mode of applying a spring to return the hammer after it has been caused to strike.

Secondly, my invention relates to an improvement in

the arrangement of the action of piano-fortes where the hammers strike downwards. And,

Thirdly, my invention relates to improved modes of applying and working the dampers of upright piano-fortes; and in order that my invention may be fully understood and readily carried into effect, I will proceed to describe the drawings hereunto annexed.

Description of the Drawings.

Fig. 1, represents the action of a piano-forte where the hammer strikes downwards. *a*, is the key; *b*, the hammer. The hammer butt moves on an axis at *c*, and is operated on by a spring, *d*, which is carried by the hammer butt, and consequently the spring with the hammer butt moves on the axis, *c*; and it is important to call attention to this peculiarity of arrangement, as this part of my invention relates to so applying a spring to return the hammers, that the instrument to which it is attached shall move on an axis, in order that one end of the spring used may be free to move on an axis. The spring, D, is affixed in the hammer butt, and forms a coil at d^1; and then the other end of the spring is attached by a strap of leather or other suitable flexible material, to the rail, *e*, the consequence of which will be, that the hammer having made a blow, will be returned by the spring, at the same time the spring in its action will not prejudicially affect the playing, because the player will not, when touching the key, perceive that there is a spring.

I would here state, that the mode of applying a spring according to this part of my invention, may be varied as to the position of placing, and also in the shape of the spring, *d*, so long as the arrangement of the spring used is such as to be free at one end to move on an axis; and in order to show that such is the case, I have, in the drawings annexed, shown figures 2, 3, and 4, where this part of my invention is carried out by differently arranged

actions for piano-fortes; thus, in figs. 1 and 2, the spring is affixed to and carried by the hammer butt, and the only difference in the arrangement of these two figures is the shape of the spring, as is clearly shown in the drawing. It will, however, be evident that in both cases the end of the spring, *d*, which is affixed in the hammer butt, moves freely on the axis, *c*, with the hammer butt; but it will be found that it is not necessary that the spring, *d*, should be fixed to the hammer butt; on the contrary, the operating of the spring, *d*, used on the hammer may be effected by intermediate means, and the spring, *d*, be applied at a distance from the hammer butt; but whatever be the arrangement of the parts of the action of a piano-forte having this part of my invention applied thereto, the spring must at one end move on an axis, which peculiarity of arrangement and application of a spring to return the hammer, as before stated, constitutes the novelty of this part of my invention; and I would remark, that I am aware that springs have before been used for returning the hammers, but in such cases the spring is not so applied to a hammer as to move on an axis.

Fig. 3, shows another action of a piano-forte where the hammer strikes downwards; and it will be seen that in this arrangement the spring, *d*, is at a distance from the hammer butt, and is connected in its action by means of a sticker, *f*, such sticker being connected to the lever, *g*, the lever, *g*, moving on an axis at g^1, the other end of the lever being operated on by the hopper, as is shown. The lever, *g*, has one end of the spring, *d*, affixed thereto, as is shown, and the other end of the spring is connected to the rail, *i*, by means of a leather strap or other suitable flexible material; hence the spring, *d*, will in this case move on the axis, g^1, and produce the desired effect of returning the hammer after it has given the blow, and without prejudice to the general operation of the piano-forte's action when playing.

Fig. 4, shows another action of a piano-forte, where the hammer strikes downwards. The spring, *d*, moves on an axis at *j*, the end of the spring being inserted into a short lever, *k*, which moves on the axis, *j*. The hammer butt is attached by a strap of leather or other suitable flexible material, *l*, to the rail, *m*, as is shown; and the other end of the spring, *d*, is attached by means of a strap of leather or other flexible material, to the rail, *m*, as is shown. Thus it will be seen that in whatever manner the spring, *d*, is applied, it is to be mounted on an axis, such axis being either for the purpose of carrying some part of the action of a piano-forte, to which one end of the spring, *d*, is affixed, as in figs. 1, 2, and 3, or otherwise; the axis of the spring, *d*, is simply used for the spring, *d*, as in fig. 4. And I would state, in respect to this part of my invention, that I make no claim to any parts of the actions of piano-fortes shown and described, nor do I confine myself to the arrangements shown when using a spring to return the hammer, according to this part of my invention.

Fig. 4, also shows the second part of my invention. *n*, is a rocking lever moving on an axis at *o*. This lever has a projection, *p*, which is acted upon by the key, *a*, and the lever, *n*, works the hopper, *q*, which is in a nearly horizontal position, the lever, *n*, being vertical; and it is the peculiar arrangement of the parts, *n*, *o*, *p*, and, *q*, for giving motion to a hammer which strikes downwards, which constitutes the second part of my invention. *r*, is the check, and, *s*, the damper-wire, which are carried by the lever, *n*, as is shown, the damper being lifted by the wire, *t*, which is affixed to the lever, *v*, which moves on an axis at *w*, consequently, when the key is acted on to give motion to the hammer, it will, by the wire, *s*, push the lever, *v*, and cause it to move on its axis, and thus lift the damper.

I will now describe the third part of my invention, which relates to improvements in the action of upright

piano-fortes, and which improvements consist of connecting the hammer butt with the lever action of the damper, as is shown in fig. 5, and also consist of a mode of connecting the damper action with an upright fixed to the key, as is shown in fig. 6.

I will first describe the mode of connecting the damper with the hammer butt.

Fig. 5, shows the action of an upright piano-forte, and it will be seen that the damper, which is connected to a lever (moving on an axis at *y*), is attached by a strap of metal, or other suitable flexible material, to the hammer butt, so that when the hammer butt moves on its axis of motion to give a blow, the damper will be removed, and the spring, *z*, will return the damper when the hammer goes back.

Fig. 6, shows another arrangement of the action of an upright piano-forte where the damper moves on an axis at A, which is carried by the hammer butt, and there is a spring at B, which tends at all times to press the damper towards the strings; the hammer butt moves on an axis at C, and the damper is drawn from the strings by means of a tape or leather strap, or other suitable material, connexion between it and the upright, D, which is affixed to the key, *a*, as is shown.

Having thus described the nature of my invention, I would have it understood, that what I claim is,

First, the mode of applying a spring to return the hammer of a piano-forte action, such spring moving on an axis, as described.

Secondly, I claim the mode of actuating the hammer of a piano-forte action where the hammer strikes downwards, by the arrangement of the parts, *n*, *o*, *p*, and, *q*, as above described. And,

Thirdly, I claim the mode of connecting the damper with the hammer butt, as described in respect to fig. 5, and also as described in respect to fig. 6.—In witness whereof, &c.

Enrolled July 15, 1842. ROBERT WORNUM.

Specification of the Patent granted to John Bould, *of Overdon, in the Parish of Halifax, in the County of York, Cotton-spinner, for an Improvement or Improvements in Condensing Steam-engines.*—Sealed December 16, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention relates to the mode of arranging the valves (which slide over the ports) of condensing steam-engines, in such manner that the exhaustion port shall be fully open at the time the piston has completed its stroke, at either end of the cylinder, and at the same time allow of the steam being worked expansively by means of the same valves; and in order that my invention may be most fully understood and readily carried into effect, I will proceed to describe the means pursued by me.

In constructing and applying valves to condensing steam-engines, the valves of which are worked by eccentrics, it is usual to form the valves of such dimensions that they will only just cover the ports or openings into the cylinder, or only very slightly exceed the dimensions of the port; hence, when the valves are moved, the ports are simultaneously or nearly simultaneously opened and closed; but according to my invention, by enlarging the size of the slides so that they will be much larger (at least twice as large as the ports they work over), the induction-valve may remain closed during a considerable length of movement of the valves; hence it may be closed at any desired part of the stroke of the engine, and the exhaustion-valve remain open to the condenser: and what is also very important, the exhaustion-valve may be fully open at the termination of the stroke at either end of the cylinder, so that a good vacuum may at the commencement of the stroke be obtained, and consequently at the time the induction port is open for the flow of steam.

Description of the Drawing.

Fig. 1, represents a diagram of a steam cylinder and valves, and also the eccentrics and parts which work the valves. In fig. 1, the valves are shown in the position they would be at the termination of the stroke at the upper end of the cylinder; and it will be seen that the exhaustion-valve has passed away from the exhaustion-port, and the induction or steam valve has partially opened the induction-port. And I would remark, that the steam-valve is not set to open the port completely, as I have found that it is not necessary, but if desired, it will be evident to the engineer that that might be done either by increasing the throw of the eccentric, or by shortening the lever, e^1, to which the eccentric rod is attached.

Fig. 2, shows a diagram of a steam cylinder and valves, and the lever which works them, the eccentric which gives motion to the lever not being shown. The valves in this figure being in the reverse position to that shown in fig. 1. The valves, *a*, *a*, are made of such length as to be equal to three times the opening of the ports, and it will be seen by bracing the movement, which will take place in the parts of fig. 1, that when the stroke in the upward direction has been completed, and the steam or induction-valve opened to the required extent, and steam admitted above the piston, the steam or induction-valve will be closed by the time the piston has moved about one-third of its stroke; but this may be varied, and the exhaustion-port will remain open, and the movement of the eccentric, and the parts actuated thereby, will near the end of the stroke, close the exhaustion-port at the lower end of the cylinder, and open the exhaustion-port at the upper end of the cylinder, and bring the parts into the positions shown in fig. 2; and it will be seen that these effects will be consequent on the enlargement of the valves in respect to the ports over which they work, and the extent of movement given to the valves, whereby one or other of the valves can be moved for a considerable

length whilst over its port, without uncovering that port, allowing the exhaustion-port to be fully open at the time of completing the stroke at either end of the cylinder. *b*, is the eccentric on the main shaft, *c*, and the rod, *d*, and levers, *e*, and, e^1, for moving the slides, one of the ordinary construction, allowing only for the quantity of motion given to the valves. And it is important to call attention to the circumstance of the distance over which the valves are moved, as on that circumstance, combined with the length of the valves, depends the beneficial results obtained. The diagrams show the parts so arranged as to cause the valves to move a distance equal to four times the depth of the ports; and if it were desired that the steam-port should be opened fully, then the valve would have to move five times the length of the depth of the port; and in case of making the valves less, to the extent of their being twice the length of the depth of the ports, then the movement given to them is to be four times the depth of the ports to fully open the steam-port, and the movement ought not to be reduced below three times the depth of the ports, as the steam-port will then be only half opened. It should be stated, that although I prefer to work the slides with an eccentric, it will be evident that a crank may be substituted, therefore, at the same time, I would wish it to be understood, that I do not claim the opening of the exhaustion-port by the time the piston arrives at either end of the cylinder, when other arrangements of valves are used, or other means than an eccentric (or its equivalent or crank) be employed for working the valves, my invention being confined to such engines as work the valves by eccentrics or cranks. And I would further remark, that although I have shown the valves as being equal to three times the length of the depth of the ports over which they work, yet I do not confine myself thereto, as they might be slightly increased, and even less extensive valves may be used, varying the other parts accordingly; but I have found

that there is little advantage to be derived when the valves are not at least equal to twice the length of their ports, measured in the direction of the movement of the valves—But what I claim is, the mode of constructing the valves of condensing steam-engines, when worked by eccentrics or cranks, whereby the exhaustion-ports may be fully opened at the completion of the stroke, and whereby steam may be cut off, and more effectually worked expansively, by the same valves as above described.—In witness whereof, &c.

JOHN BOULD.

Enrolled June 16, 1842.

Specification of the Patent granted to HENRY BENJAMIN, *of Saint Mary-at-Hill, in the City of London, Fish-factor, and* HENRY GRAFTON, *of Chancery-lane, in the County of Middlesex, Philosophical Instrument Maker and Machinist, for Improvements in Preserving Animal and Vegetable Matters.*—Sealed January 27, 1842.

To all to whom these presents shall come, &c., &c.—Our invention relates to preserving of animal and vegetable matters by freezing or cooling them by the aid of freezing mixtures, and in order that our invention may be fully understood and readily carried into effect, we will describe the means pursued by us, and as our invention is particularly applicable in preserving fish, we will first describe the means we pursue for preserving fish, according to our invention. The fish intended to undergo the process is subjected to a freezing mixture, composed of ice pulverized and mixed with common salt, and we use for such mixture about one part of salt and six parts of ice, and when such fish has undergone the process and has become completely frozen, it will remain preserved. We place the fish intended to be frozen, in a copper or

other metallic vessel and fill it up with cold water, and the vessel containing the fish and water is deposited in a mixture of pulverized ice and salt, as before mentioned, the said mixture being in a wooden trough. The fish thus prepared may be kept in a pure state for a considerable length of time by the application of the freezing mixture, in order to keep the same frozen. In those cases where the fish is only required to be kept preserved for a short time, we employ freezing mixtures to cool the air of a close room, made of brick or other suitable material, sufficiently excluding the heat of the sun, and the fish to be preserved being placed in such room or chamber in baskets or on slabs, we cause the air to circulate against the surfaces of metal vessels containing freezing mixtures by means of revolving fans or other suitable means, within the room or chamber, the object being to keep the air of the room in constant movement, by which it will be found that the moisture taken up by the air will from time to time become frozen on the surfaces of the metal vessels containing the freezing mixture, and the same must be brushed off continually in order to keep the surfaces clean, as the frost on the vessels would otherwise retard the effect of cooling the circulating air. By this arrangement the fish will be kept cool and preserved, and if it has been previously frozen, as before described, the keeping it in a room or chamber, as here described, would retain it in a frozen state. In preserving meat or vegetables, we treat those matters in the same manner as described for fish, and it only remains to be stated, that although we have only described ice and salt in particular quantities, we do not confine ourselves thereto, as salt may be used in larger or smaller quantities in respect to the ice, the larger quantities of salt increasing the degree of cooling effect. And we would state, that although we prefer ice and salt as the freezing means we do not confine ourselves thereto, as other well known freezing mixtures may be resorted to; at the same time we would

have it understood, that we make no claim to such freezing mixtures when separately considered, but only their use and application for freezing or cooling animal and vegetable matters to preserve them. And we would state, that we are aware that ice alone has been used for cooling animal matters to preserve them, but when alone ice is of comparatively little use; we do not, therefore, claim the use of ice when uncombined with other material or materials for obtaining a freezing mixture.—In witness whereof, &c.

HENRY BENJAMIN.
HENRY GRAFTON.

Enrolled July 27, 1842.

LAW REPORTS OF PATENT CASES.

Common Pleas, Westminster Hall.

Before Lord Chief Justice TINDAL *and a* SPECIAL JURY.

February 11, 1840.

CRANE *v.* PRICE *and* OTHERS.

(*Continued from page* 188.)

John Morgan, sworn—Examined by Mr. Richards.—I am agent to Mr. Crane. I remember in May, 1838, being sent to Mr. Price's works at Neath Abbey. I saw the fillers using the anthracite in quantities of from about five hundred weight, mixed with about nine hundred weight of coke made from bituminous coal. The quantity of iron stone or mine was about fourteen hundred weight to a charge: they were using hot blast. In Mr. Crane's No. 1 furnace, stone coal and coke are used in about equal parts. In No. 2 furnace all stone coal is used. No. 3 furnace is now at work with all stone coal. Mr. Crane uses the hot blast; it is sufficiently hot to melt lead. The iron made by Mr. Crane is better than either that made by cold or hot blast by the old means.

Cross-examined by Mr. Solicitor-General.—I went to Neath Abbey works alone. The mode of charging the furnace is by so many barrows of one sort of thing and so many barrows of another. I made a memorandum of how many barrows of each was put in; there was one barrow of stone coal to three of coke. I saw the operation several times; the quantities were always the same. Stone coal or anthracite can be obtained close to Mr. Crane's works; there is more there than could be used in a thousand years.

John Buckland sworn—Examined by Mr. Smith.—I am master moulder at the Ynyscedwyn iron works, and have been for the last thirty years. The works are situated on what is called the anthracite or stone coal formation. They extend to Pembroke, which is about sixty or seventy miles. I have known several attempts before Mr. Crane's patent to use anthracite coal, but they have all been failures. Mr. Crane's No. 2 furnace is called a cupola furnace; it was first put to work with the hot blast in February, 1837. There was a little coke put in the furnace to begin, but afterwards nothing but anthracite was used, and has been burnt ever since without any other coal. The blast lasted two years and four months and was then blown out, and after putting in a new hearth it was put in blast again—it was out of blast about five weeks. The temperature of the blast is about 600° of Fahrenheit. Before 1837 No. 2 furnace was worked with bituminous coal. The iron produced by the use of the anthracite is much stronger than that made by the common coal. The yield of the furnace has increased since the introduction of the anthracite, and the quantity of fuel required is less.

Cross-examined by Mr. Sergeant Bompas.—One of the attempts to use anthracite coal was made at Abbercrane in 1827, by Mr. Crane. I saw it three or four times. There was only one twire to the furnace at which the experiment was tried. The stone coal was most of

it thrown on to the twire. A shovel full was thrown on every charge, that is, once in forty-eight hours. That shovel full jobbed the twire, and it was obliged to be drawn off.

The Lord Chief Justice.—What is the subject of this cross-examination? I do not exactly see it, because at the most it is only an attempt made in 1827, in which they did not exactly succeed. There is no doubt the thing is done. Your defence is, that it is not new.

Re-examined by Sir F. Pollock.—The attempts which I spoke of as having been tried before Mr. Crane's patent to use anthracite coal, was not done with hot blast. I never knew hot blast used with anthracite before Mr. Crane's patent.

Rees Davis—Examined by Sir F. Pollock.—I have been furnace manager to Mr. Crane for three years. The hot blast apparatus was erected before I went to him. The furnaces are charged under my direction. When I first went to the works coke was used in No. 2 furnace, but shortly after we began to put stone coal in, and I think about the 7th February we put in all stone coal, and it continued so two years and a-half. The iron produced by the stone coal is stronger, and there is an increase in the quantity. In the furnace No. 2 we got thirty or thirty-two tons per week on the average, and before that we only got twenty-two or twenty-three tons. I was in the employment of the British Iron Company at Abbercrane in 1826 and 1827; I had been on the same works since 1820; they used the cold blast. Mr. Harper built a small furnace to try an experiment with the stone coal; he tried three furnaces, the two last furnaces were larger than the first; the first succeeded, but the larger ones failed—it was merely an experiment. The cold blast only was used.

Cross-examined by Mr. Sergeant Bompas.—The large furnace of the British Iron Company was in work alto-

gether about a month or five weeks, and then the hearth was cleared out and repaired aud again put into operation. It continued at work as long as I remained there, which was about ten or eleven months, but not in the same way as before. Sometimes it was blown in with all coke, and then some stone coal was put in, and then left off, perhaps a fortnight; they again applied more and more stone coal, and again discontinued it for a week or a fortnight, but never in any instance did they use all stone coal. In Mr. Crane's No. 2 furnace nothing has been used but stone coal for two years and a-half. No. 3 furnace was put to work about two years ago. No. 1 has been in work about a year and a-half. We began with coke to blow them in: we tried them with all stone coal, but we did not find it answer so well in the larger furnace; we tried six parts of stone coal to one of coke. We have since used half stone coal and half coke, and afterwards tw oofstone coal to three of coke. The quantity of stone coal has been increased, and the last day we came here it was all stone coal.

Re-examined by Sir F. Pollock.—The last time any furnace was in blast at Abbercrane was in 1827; there never was more than one furnace in blast there except the small experimental one. I never saw hot blast or heard it talked of at that time. In Mr. Crane's No. 2 furnace nothing but stone coal has been used for upwards of two years and three months. Mr. Crane had not enough stone coal for all the three furnaces.

David Mushett—Examined by Mr. Richards.—I have been acquainted with the iron districts in this country for the last forty years, and the different modes of manufacturing iron. I was managing director to the British Iron Company in 1826: I was at their works at Abbercrane in that year; they were at that time endeavouring to use as much stone coal as could be done with propriety. I think they were using about three-eighths of stone coal to

five-eighths of bituminous coal, and at another time nearly equal proportions. Hot blast was not at any time used. The quality of iron produced was forge iron—I should think decidedly inferior for casting purposes. The quantity was moderate. The first four months of the blast they were making two hundred tons of pig iron or castings, which was at the rate of twelve tons per week, and I think the last four months of the blast they made at the rate, upon an average, of twenty-two and twenty-four tons per week, which in these days I consider a very small quantity; it would never pay, because the common charges upon that sort of iron are very high indeed. The iron was not, in my opinion, marketable for any but forge purposes. I think the cost of manufacture for the last four months of the blast was about 6*l.* per ton, and the previous four months about 8*l.* per ton. It never realized 4*l.* per ton. I had great difficulty in finding a customer for it. The only customer I ever met with was the Neath Abbey Company. Mr. Price objected to purchase it on account of its being of so bad a quality. The Abbercrane works were abandoned by my advice about a month after I had them. There was a sleeping rent of 400*l.* per year, which I recommended the Company to pay rather than continue the works. The anthracite is of an intractable nature, and the difficulty of working has been long known in the trade. I never knew before Mr. Crane's patent, of the hot blast being used with anthracite. I have been all my life engaged on the subject of iron. Since Mr. Crane's patent I know of two new works having been established in the stone coal districts, and I have heard of several others. I have tried the strength of Mr. Crane's iron by the experiments that were published by the late Mr. Tredgold, and I followed the same plan as he did, which was, by having a bar of a given length stuck into a wall or building, and a weight suspended to the end so as to give the same degree of pressure throughout. The bar was about one and a-half inches broad by

three-quarters thick. I find, upon an average of Mr. Tredgold's experiments, that the breaking weight of iron of the old manufacture of these dimensions, and tried in that manner, would be 173lbs., but I found the breaking weight of Mr. Crane's No. 2 furnace, in which all stone coal was used, to be 209½lbs. The No. 3 furnace, in which two-thirds stone coal was used, 199lbs., and in No. 1, where only one-third stone coal was used, 180lbs.

Francis Northall, sworn—Examined by Mr. Smith.—I am furnace manager to Mr. Crane. I was engaged at the Abbercrane works in 1826. While I was there, there was only one furnace in blast. The fuel we used was partly coke and partly stone coal—the greater part was coke. The only blast we used was cold blast. We tried it from April to February, but it was a total failure. If we had then known what we do now we could have mastered it. We wanted the hot blast. When I left Abbercrane I blew out the furnace, and so it has continued ever since. The iron we made cost very near 6*l.* per ton; the Company lost 2*l.* a ton by it. During the time I have been with Mr. Crane I have attended regularly every day; his process is quite successful; the quality of the iron is excellent. There is no such iron made in this kingdom as the anthracite coal iron made at Ynyscedwyn.

Cross-examined by Mr. Rotch.—There was great difficulty in getting the cold blast through the furnace at Abbercrane when it was charged with anthracite, and when we could, the iron was very middling; where there was one or two tons middling there were ten tons bad. The furnace was a very good one, and there would have been no difficulty if we had had the hot blast.

Thomas Strick, Esq., sworn—Examined by Sir F. Pollock.—I am an iron-founder. My foundry is in Swansey Valley. I am acquainted with Mr. Crane's iron. I consider it better and stronger than iron made in the ordinary way. I believe Mr. Crane's process is new. I never heard of hot blast being used with anthracite before

his patent. Attempts had been made to use anthracite with cold blast, but they all failed. There are vast districts of anthracite in Wales, and since it has become useful by the application of hot blast, the value of property has increased at least ten-fold.

William Brough sworn—Examined by Sir F. Pollock.—I am a mineral surveyor and civil engineer, and have been for the last forty or fifty years. For the last twenty years I have followed my profession in Cwm Neath and Cwm Fawey, in Glamorganshire. I am acquainted with the large basin; it extends from Cwm Neath to Pembrokeshire, which is about seventy miles, and its width is about eight miles. I am acquainted with Mr. Crane's invention, and I believe it to be new. Since the patent was taken out, the demand for anthracite has greatly increased, and it has brought speculation into that part of the country to build furnaces to make iron, by reason of the anthracite being made capable of smelting. To the best of my knowledge stone coal had never been tried before Mr. Crane's patent for smelting with a hot blast. I have seen it tried with coal blast, but it did not succeed. I called the public attention to the subject in the public newspapers respecting its great use, that it was a great desideratum if it would smelt iron.

Cross-examined by Mr. Solicitor-General.—In making iron with stone coal and hot blast, the process is nearly the same as when making iron with the cold blast,—there may be some difference, perhaps, in the quantities that form the charges. The anthracite sends off very little flame and no smoke. The free coal does not resemble the anthracite; it sends off more flame and smoke, but not so much as bituminous coal. There is no gradation in the description of coal found in Wales, from bituminous to an approximation to anthracite, until it becomes quite anthracite. It is suddenly anthracite; and as you go east it ceases to be so; as you go west it continues to the

very end of the basin. The bituminous coal overlies the whole of the anthracite many fathoms, perhaps 200. The anthracite is never found near the free burning coal, it is many fathoms from it. It is never intermixed. The small free burning coal will not coke. It is used for some purposes, but very little where the real stone, called culm, is to be got.

John Arthur sworn—Examined by Mr. Richards.—I am an iron-master and coal-merchant, and have been connected with the iron trade for the last twenty-five years. I purchased of Mr. Protheroe the Pwlfaron Colliery, with other collieries in the same valley. The coal I obtained at Pwlfaron was the anthracite. Until Mr. Crane's patent, I never heard of hot blast being applied to stone coal in the manufacture of iron. I have heard of its having been attempted to be used with cold blast. I sold the Pwlfaron Colliery to the defendant after Mr. Crane's patent was taken out. Since then the value of stone coal has much increased. I am building works called Bluengeragh and Forch Goch. They are in the stone coal district. I made an attempt some time ago to bring out a concern in the same situation, by a joint company, but not with anthracite; but I failed. I had bituminous and anthracite on the same property. When Mr. Crane succeeded in making iron with anthracite, I had no difficulty in finding a company, and now I am erecting the works I have mentioned for that purpose.

Cross-examined by Mr. Sergeant Bompus.—I applied to Mr. Crane before I erected my works, for a license under his patent to make iron with anthracite and hot blast, and he granted me one. I was to pay him a shilling a-ton; and if he paid a shilling a-ton to Neilson, I was to pay it. I had no agreement with Neilson. Mr. Crane told me if there was any difficulty in getting a license from Neilson he would undertake to get it.

John Crowe sworn—Examined by Mr. Smith.—I am a

chain-cable manufacturer. I have tested the specimens which I now produce. They are part of those marked C. The diameter of C is $\frac{3}{4}$ of an inch. I tested them with an hydraulic machine. The specimen, C, broke with a strain of 19 tons. The iron which I previously used, made by the old process, broke at 16½ tons. The specimen, B, is of smaller diameter; it broke at 16½ tons. The quality is much better than any iron I have before used.

David Rosser sworn—Examined by Sir F. Pollock.—I am a master smith. I have purchased anthracite iron from the Yniscedwn Works. I have used it for various purposes. I have been acquainted with the properties of iron. I consider the anthracite iron the best I ever saw.

John Taylor sworn—Examined by Sir F. Pollock.—I am a bricklayer at the Calder Iron works near Glasgow. Messrs. Dixon are the owners of those works. The hot blast was used there. It was put up under the superintendence of Neilson, about eight or nine years ago. It was made of boiler-plate malleable iron. The pipe for letting in and out the air was 9 inches diameter. The cylinder was about 3 feet wide, and perhaps 10 feet long. It was heated by a furnace below it, and was placed on a brick arch to keep it from the fire. There were two half-moons in the cylinders to spread the air. The highest temperature we ever got was between 300 and 400 degrees. It never exceeded 400. We tried a great many other modes, but they all failed. Mr. Cundy then became manager of the works, and he drew a plan which was quite successful, and has been in operation for the last four years. These experiments were all after Neilson's patent was taken out. We were about two years trying experiments, and they cost Mr. Dixon 5,000*l.* or 6,000*l.* Neilson's invention never succeeded.

William Carpmael sworn—Examined by Mr. Smith.—

I have for many years paid great attention to the manufacture of iron, and have read the specifications of all patents that have been granted for improvements relating to that manufacture. The first patent wherein the use of anthracite is mentioned, is, I believe, Martin's, which was granted in 1804. In my judgment, by the mode there described it would be impossible to make iron by the use of anthracite. The invention is very ingenious; but it would fail as soon as a blast of air was got upon it. There is no particular blast mentioned; it is described as the "blast;" no other blast than the cold blast was known at that time. I have read the specification of Philip Taylor's patent. The object of this invention was to use carburetted hydrogen gas, for this reason, anthracite or stone coal not containing that property, and other coal possessing that property, he proposed to use them together, and thereby to supply it artificially, in the process of blasting by the ordinary cold blast. This invention, so far as my knowledge goes, was a failure. I have read the specifications of Botfield's, Neilson's, and Devaux's patents. Mr. Botfield's invention is to use, with or without the blowing apparatus, heated air. If he uses it without, he has a chimney to get an extra draft, and he conjoins with that the ordinary blowing machinery. Mr. Neilson's patent is for the application of hot air to smelting furnaces generally. He proposes to place between the blowing apparatus and the furnace to be blasted, a vessel, which is to be heated, and he says that the air vessel should increase in dimensions as the furnace to which it applies increases in capacity or dimensions. The effect of following these directions would be, that, as you increased the internal capacity, you would relatively decrease the heating surfaces.

(To be continued.)

KIPLING *v.* JOHNSON.

August 24, 1842.

Worship-street.—Mr. Bingham gave his judgment in this case, which is one of the first cases under a recent Act of Parliament for the protection of copyright in designs, &c.

The defendant, Mr. G. Johnston, of Finsbury-square, was summoned under the Act to answer the complaint of Messrs. Kipling and Co., carpet manufacturers, upon a charge of publishing and disposing of for profit, without the license or consent of the complainants, a certain article of manufacture called carpet, wherein had been used an original part design made for the pattern of the said carpet, whereof the complainants are the registered proprietors.

There was a second summons against the same defendant for an alleged piracy of another of Messrs. Kipling's patterns, which it was agreed should be determined by the magistrate's decision in the first case.

Mr. Clarkson attended as counsel for the complainants, and *Mr. Chambers* on the part of the defendant. The matter appeared to have excited intense interest amongst the manufacturers.

Mr. Joseph Ratheray, agent to Messrs. Kipling and Co., proved that on the 15th of March he registered for them two new patterns of carpets now produced, and he produced the certificates of registration. The pieces of carpets sold by the defendant and now shown were copies of the original registered pattern with some little variation. On the 20th or 21st of June he met the defendant in Newgate-street, and had some conversation with him on the subject, and the defendant then said, that he had been to the Registrar-office to ascertain whether the patterns had been registered or not, and he found that they had.

When cross-examined by *Mr. Chambers,* he said, that

the drawing now pointed out was what was technically called "the design," and its combination with the other parts constituted the finished and original pattern. A piece of floor-cloth being now shown to him, he said the figures in it had some resemblance to the registered design, but there was a difference in the filling up, such as the substitution of a line for a diamond, and so on.

Mr. Henry Ridley Ellington, manager of complainant's business in Newgate-street, proved that on the 15th of July he went to Mr. Johnson's shop at Finsbury-square, and purchased the produced pieces of carpet. The defendant, in answer to his observations respecting them, said, that he conceived he had a right to sell them without reference to their being registered.

The registered patterns of the complainants being compared in court with those sold by the defendant, it was evident that the latter contained the principal figures of the former, with some little variation in the filling up.

The Counsel for the defendant contended that there was no case produced upon which he could be convicted under the statute.

Mr. Bingham, in giving his judgment, said, that his opinion upon the evidence he had heard was, that the design of the carpet produced by the complainants was an original design, that the one sold by the defendant was a copy, and that he sold it knowing that no consent had been given. Upon all the points it was a case within the meaning of the Act, which rendered the defendant liable to a penalty of from 5*l.* to 50*l.*

The defendant was ordered to pay a penalty of 5*l.*, and the costs upon each of the two summonses.

SCIENTIFIC MISCELLANEA.

Progress of Foreign Science.

Report of the Commission of the Academy of Sciences

upon the Memoir of M. Ebelmen, on his Researches on the Composition and Employment (for manufacturing purposes) of the Gases evolved from Blast Furnaces.

(*Continued from page* 122.)

1. The belly of a blast furnace is an apparatus wherein the charcoal loses its moisture. Hydrogen and carbonic oxide.—Where wood loses its moisture. Hydrogen and disengaged acetic acid. Oxycarburets and carburets of hydrogen.—Where the flux and the metal are robbed of their moisture and of carbonic acid.

2. There is little chemical action between the charcoal and the ore.

3. There is little chemical action between the charcoal and the carbonic acid, either that which the flux produces, or that produced by the fuel and the oxigen of the ore.

4. The only chemical action of which the belly is the theatre, is the conversion of the iron ore into magnetic oxide, by the reaction of the oxigen of the ore, and of the carbonic oxide produced in the lower regions of the furnace.

5. The hydrogen produced by the distillation of the fuel, as well as that resulting from the decomposition of the hygrometric water, introduced with the air by the twyres, does not appear to exercise any chemical action in the blast furnace. This result is exactly in accordance with the experiments of Mr. W. Henry, which demonstrate, that oxygen in presence of hydrogen and of carbonic oxide, unites in preference to the latter, either under the influence of spongy platina or of heat.—(See "Phil. Mag.," May, 1835, and Nov., 1836.)

It accords also with what we know of the influence of the chemical mass of two bodies, susceptible of uniting singly with a third, and which are in proportions very different to this last, viz., that it is the body present in greatest abundance which enters into combination in preference to the other. So here it is the case of the carbonic oxide

relatively to the hydrogen of the ascending column. The first is greatly more abundant than the second.

6. The quantity of charcoal consumed from the boshes to the part where the last portions of carbonic acid are transformed into carbonic oxide, is six per cent. of the total amount of charcoal.

7. The ore loses in the belly $\frac{28}{33}$ of its oxygen by the reaction of the carbonic oxide, and loses the remaining $\frac{5}{33}$ between the boshes and the twyre, by the direct action of the charcoal. It is probable that the iron begins to burn in the lower half of the boshes; and it is certain that it is at 0.3 metres above the twyres that the fusion of the slag and of the cast-iron takes place.

According to M. Ebelmen, the space in the furnace of maximum heat is very small, and this is the cause of the rapidity with which the carbonic acid becomes carbonic oxide, in taking up a quantity of carbon equal to what it already contained. But he also, by applying the experiments of Dulong, establishes a result more extraordinary, but which it is difficult not to admit, namely, *that the conversion of the carbonic acid into carbonic oxide, must be accompanied with a considerable cooling;* and hence the space of maximum heat becomes very confined, and beyond this space the calorific effect of the ascending column on the descending bodies must be much more feeble than if the carbonic acid of the first was not changed into carbonic oxide.

In fact, two litres of atmospheric oxygen in producing two litres of carbonic acid, develop a temperature of 2232°; whilst in producing four litres of carbonic oxide, they only develop 780°. There is, hence, a cause incessantly at work to lower the temperature from 2232° to 780°.

It is evident that the preceding observation conducts us to a total distinction between hollow furnaces when the substance to be treated is mixed with a quantity of fuel sufficient to change the carbonic acid into carbonic oxide,

from reverberatory furnaces, when the fuel is on a grate in a thin sheet, separated from the substance to be acted on.

If we pursue with M. Ebelmen the research as to the causes which render the high temperature developed in blast furnaces necessary to the preparation of iron, we see at once that the weight of the ore of the flux and of the fuel which enter the furnace, *are not more than one-half the weight* of the ascending gaseous column which issues from it; and hence that the specific heats of the three first, or of the descending column, is very much below that of the ascending or gaseous column; hence it is not the mere heating of the ore, the flux, and the fuel, which will account for the demand for so high a temperature.

The principal causes of cooling in the belly of the ascending column are, the drying of the ore, of the flux, and of the fuel, and the expulsion of the carbonic acid from the limestone.

On the other hand, we have seen how the conversion of the carbonic acid into carbonic oxide tends to cool the upper part of the hearth. Now, there exists a third cause of cooling of the ascending column, namely, the heat which must disappear by the very fact of the reduction of the iron, or, in other words, by the transfer of the oxygen of its oxide to the carbonic oxide, and to the carbon,—effects which take place in succession in the belly above, then in the boshes, and lastly in the hearth.

Dulong having shown that 1 litre of oxygen in combining with iron develops 6216 units of heat (calorics), it follows that this heat must be restored in the reduction of the oxide. Now, knowing that 1 litre of oxygen in burning 2 litres of carbonic oxide develops 6216 units of heat, we arrive at this remarkable result, that in the belly, where the carbonic oxide is changed into carbonic acid, at the expense of the oxygen of the iron ore, there is almost an exact compensation between the cause which tends to render latent 6216 units of heat, and the cause

which tends to develop the same; consequently, in the belly the iron is reduced without any sensible calorific effect on the part of the carbonic oxide.

In the lower part, where the reduction of the oxide of iron gives rise to carbonic oxide, 1 litre of vapour of carbon in mixing with 1 litre of oxygen, produce only 1598 units of heat; whilst there is needed 6216 units to separate the oxygen of the iron; it is evident that we must obtain by direct combustion of oxygen and carbon, the difference, or the 4618 units of heat which are wanting.

These considerations show that the oxide of iron is reduced by the carbonic oxide in the belly of the furnace, rather than by the direct action of the charcoal in the boshes and hearth, and hence we may perceive the advantages of operating on ores in a very minute state of division, which can be reduced by the carbonic oxide rather than on the native amhydrous oxides, or still more the silicates of iron, which are not reducible by carbonic oxide, at least at the temperature of the belly of the furnace.

The researches of M. Ebelmen have conducted him to giving a satisfactory explanation of the propriety of the established form of interior in blast furnaces; an explanation not without interest, as it furnishes a proof that practice, after many trials, no doubt, has come to construct an apparatus the best possible for its object, in burning the fuels we at present make use of. In fact, the air thrown in horizontally and at opposite sides by the blast cylinder, mounts vertically in the hearth, occupying the whole of its width, and the height of this part of the furnace must be greater in proportion, as the refractoriness of the ores require a higher and more sustained temperature. In the boshes we may presume that the carburation and reduction by the charcoal of the iron commences. The contact of the gas with the matters of the descending column not being more necessary than in the hearth, we

perceive how the funnel shape of this part of the furnace is consistent with theory. Lastly, the ore, losing the greater part of its oxygen by the contact of the carbonic oxide in the belly, we see how the form of this part of the furnace—that of a truncated cone with the wider base down—collects together the streams of gas, forces them into intimate and prolonged contact with the ore, and thus favours the reducing action of the carbonic oxide upon the oxides of iron.

Of the Employment of the Gas of Blast Furnaces as Fuel.

Two distinct cases present themselves when we endeavour to make use of the gas from blast furnaces as a combustible. The first is, when we wish to raise to a moderate temperature the surface of considerable masses, as for heating the air for hot blast, steam-boilers, drying-ores, or fuel, scorching wood (for fuel, namely), burning lime, or bricks, &c. The second is, where we wish to develop a high temperature, such as that requisite for refining iron or working bar-iron. In the latter case, the gas must be, as far as possible, free from vapour of water, must flow in a constant manner, along with the air requisite for its combustion, and through a very short space and near the orifice by which it enters (from the furnace, namely), in order that its temperature may be as high as possible. It is for the first of these purposes especially that M. Aubertot has made use, in 1809—1811, of the gases from his blast furnaces.

The use of these same combustible gases in the refining of iron and working the bars,—a natural result of M. Aubertot's labours—now seriously engages the attention of iron-masters, and it is to generalize and illustrate this branch of the subject that M. Ebelmen has dedicated to it the last portion of his researches.

After having given a "sketch" of the apparatus put up by M. Faber Dufour, at Vasserhalfingen, for puddling

cast-iron, he applies the data of his analysis to the calorific effects resulting from the combustion of the gases of the blast furnaces of Clerval and Audincourt, taking these from the mouth and various parts of the belly to the top of the boshes inclusively.

Clerval Blast Furnace.

The quantities of heat given per minute in burning the gases, supposed dry, taken near the mouth, were—

Metres below the mouth.	Units of heat.			
	8849.5	giving	1360	deg. centigrade.
at 2.67.	8483.2	...	1462	...
4.00.	9484.0	...	1637	...
5.33.	10765.0	...	1826	...
5.67.	10247.0	...	1832	...

Audincourt Blast Furnace.

The quantities of heat developed per minute in burning the gases, supposed dry, taken near the mouth, were—

Metres below the mouth.	Units of heat.			
	13910.0	giving	1298	deg. centigrade.
at 3.33.	13923.0	...	1693	...
4.33.	14990.0	...	1732	...
5.50.	14529.0	...	1850	...
6.67.	16080.0	...	1850	...
8.04.	15084.0	...	1877	...

(To be continued.)

PATENTS GRANTED FOR SCOTLAND,

From July 27 *to August* 31, 1842.

Thomas Hendry, of Glasgow, Scotland, Mechanic, for certain improvements in machinery for preparing and combing wool and other fibrous materials.—Sealed July 27, 1842.

Thomas Waterhouse, of Edgley, in the county of Chester, Manufacturer, for a certain improvement or im-

provements in machinery used for carding, drawing, and roving cotton, wool, flax, silk, and other similar fibrous material.—Sealed July 27, 1842.

John Osbaldeston, of Blackburn, in the county of Lancaster, Metal Heald-maker, for improvements in looms for weaving.—Sealed July 29, 1842.

William Geeves, of Old Cavendish-street, in the county of Middlesex, Gentleman, for improvements in machinery for cutting cork.—Sealed July 29, 1842.

John Woodcock, of Manchester, in the county of Lancaster, Millwright, for certain improvements in the construction of steam-engines.—Sealed August 1, 1842.

Alexander Johnston, of Hillhouse, in the county of Edinburgh, Esquire, for certain improvements on carriages, which may also be applied to ships' boats and various other purposes where locomotion is required.—Sealed August 2, 1842.

Julius Seybell, of Golden-square, Westminster, in the county of Middlesex, Manufacturing Chemist, for certain improvements in the manufacture of sulphate of soda and chlorine.—Sealed August 11, 1842.

Benjamin Biram, of Wentworth, in the county of York, Colliery Viewer, for certain improvements in the construction and application of rotary engines.—Sealed August 11, 1842.

John Anthony Tielens, of Fenchurch-street, in the City of London, Merchant, being a communication from abroad, for improvements in machinery or apparatus for knitting.—Sealed August 22, 1842.

William Hancock, the younger, of Amwell-street, in the county of Middlesex, Gentleman, for certain improvements in combs and brushes.—Sealed August 16, 1842.

Job Cutler, of Lady Pool-lane, in the borough of Birmingham, Gentleman, for improvements in the construction of tubular flues for steam-boilers, and in the manufacture of tubes for such and other purposes.—Sealed August 23, 1842.

Henry Barclay, of Bedford-row, in the county of Middlesex, Dentist, for a composition or compositions applicable as tools or instruments for cutting, grinding, or polishing glass, porcelain, stones, metals, and other hard substances.—Sealed August 25, 1842.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, Civil Engineer, being a communication from abroad, for improvements in machinery or apparatus for making or manufacturing screws, screw-blanks, and rivets.—Sealed August 31, 1842.

LIST OF NEW PATENTS.

Charles Frederick Guitard, of Birchin-lane, Notary Public, for certain improvements in the construction of railways.—Sealed August 31, 1842.—(*Six months.*)

Charles Thatcher, of Midsomer Norton, Somerset, Brewer, and Thomas Thatcher, of Kilmersdon, in the said county, Builder, for certain improvements in drags or breaks to be applied to the wheels of carriages generally.—Sealed August 31, 1842.—(*Six months.*)

Robert Hazard, of Clifton, near Bristol, for certain improvements in ventilating carriages and cabins of steam-boats.—Sealed September 3, 1842—(*Six months.*)

William Rocke, of Princes-end, Stafford, Mechanic and Engineer, for improvements in the manufacture of mineral colours.—Sealed September 3, 1842.—(*Six months.*)

William Warburton, of Oxford-street, Gentleman, for improvements in the construction of carriages and apparatus for retarding the progress of the same.—Sealed September 8, 1842.—(*Six months.*)

John Wordsworth Robson, of Jamaica-terrace, Commercial-road, Engineer, for certain improvements in

machinery and apparatus for raising, forcing, conveying, and drawing off liquids.—Sealed September 8, 1842.—(*Six months.*)

James Insole, of Birmingham, Saddler's Ironmonger, for improvements in the manufacture of brushes.—Sealed September 8, 1842.—(*Six months.*)

Joseph Henry Tuck, of Francis-place, New North-road, Engineer, for certain improvements in machinery or apparatus for making or manufacturing candles.—Sealed September 8, 1842.—(*Six months.*)

William Edward Newton, of Chancery-lane, Civil Engineer, for improvements in machinery or apparatus for making or manufacturing screws, screw-blanks, and rivets.—Sealed September 8, 1842.—Communicated by a foreigner residing abroad.—(*Six months.*)

Herbert George James, of Great Tower-street, London, Merchant, for certain improvements in machines or apparatus for weighing various kinds of articles or goods.—Sealed September 8, 1842.—Communicated by a foreigner residing abroad.—(*Six months.*)

William Fothergill Cooke, of Copthall-buildings, Esquire, for improvements in apparatus for transmitting electricity between distant places, which improvements can be applied, amongst other purposes, to apparatus for giving signals and sounding alarums at distant places, by means of electric currents.—Sealed September 8, 1842.—(*Six months.*)

Thomas Thirlwall, of Low Felling, Durham, Engine Builder, for certain improvements in lubricating the piston rods of steam-engines and of other machinery.—Sealed September 8, 1842.—(*Six months.*)

William Crofts, of New Radford, Nottingham, Lace Machine Maker, for improvements in the manufacture of figured or ornamental lace.—Sealed September 8, 1842.—(*Six months.*)

Thomas Marsden, of Salford, Machine Maker, and Solomon Robinson, of the same place, Flax Dresser, for

improvements in machinery for dressing or hackling flax and hemp.—Sealed September 8, 1842.—(*Six months.*)

James Wake, jun., of Goole, in the county of York, Coal Factor, for certain improvements in propelling vessels.—Sealed September 9, 1842.—(*Six months.*)

John Rolt, of Great Cumberland-place, Middlesex, Esquire, for certain improvements in saddles.—Sealed September 15, 1842.—(*Six months.*)

Frederick Bowles, of Moorgate-street, London, for a new method by machinery of preparing flour from all kinds of grain and potatoes, for making starch, bread, biscuit, and pastry.—Sealed September 15, 1842.—Communicated by a foreigner residing abroad.—(*Six months.*)

Christopher Nickels, of the York-road, Lambeth, Gentleman, and Caleb Bedells, of Leicester, Manufacturer, for improvements in fabrics produced by lace machinery.—Sealed September 15, 1842.—(*Six months.*)

William Henry James, of St. Martin's-lane, Civil Engineer, for certain improvements in railways and carriage-ways, railway and other carriages, and in the mode of propelling the said carriages, parts of which improvements are applicable to the reduction of friction in other machines.—Sealed September 16, 1842.—(*Six months.*)

John Sanders, William Williams, Samuel Lawrence Taylor, and William Armstrong, all of Bedford, Agricultural Implement Makers, and Evan William David, of Cardiff, for improvements in machinery for ploughing, harrowing, and raking land, and for cutting food for animals.—Sealed September 22, 1842.—(*Six months.*)

Patrick Stead, of Halesworth, Suffolk, Maltster, for improvements in the manufacture of malt.—Sealed September 22, 1842.—(*Six months.*)

John Juckes, of Putney, Surrey, Gentleman, for improvements in furnaces.—Sealed September 22, 1842.—(*Six months.*)

Macintosh, Printer, Great New-street, London.

THE

REPERTORY

OF

PATENT INVENTIONS.

No. CVII. NEW SERIES.—NOVEMBER, 1842.

Specification of the Patent granted to MOSES SPERRY BEACH, *of Norfolk-street, Strand, in the County of Middlesex, Printer, for Improvements in the Construction of Printing-presses.*—Sealed March 23, 1842.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—

Description of the Drawings.

Fig. 1, is a view of one side of a rotary printing-press, having the improvements applied thereto.

Fig. 2, is a plan or bird's-eye view of the same printing-press, with the improvements.

Fig. 3, is also a side view of the same rotary printing-press, with the improvements applied thereto.

In these figures, A, A, represents the side framings of the machine. B, B, C, C, are four cylinders, upon two of which, B, B, the type are adjusted; they are called the type cylinders. The cylinders, C, C, are covered with the quantity of cloth or blanketing to obtain a good impression from type, and are hence called the impression or platen cylinders. The paper being properly damped, is

wound around the shaft, M, in any desirable quantity, and passes from it in a horizontal direction between the first pair of cylinders, B, C, receiving an impression on the upper side, the type cylinder, B, in this pair of cylinders being uppermost. The paper then passes between the second pair of cylinders, B, C, receiving an impression on the under side, the type cylinder, B, being undermost in this pair of cylinders. An apparatus for inking the type is attached to each of the type cylinders, B, B. The one attached to the second type cylinder is, however, mostly hidden by the framing of the machine. a, a, a, are three of the four inking rollers, two for each of the type cylinders, B, B. *b*, *b*, are the two ink troughs, one for each of the type cylinders, B, B. *c*, *c*, are two small taking rollers, one for each of the ink troughs, *b*, *b*. *d*, *d*, are two trough rollers, one for each of the ink troughs, *b*, *b*. *e*, *e*, are two distributing rollers, one for each of the ink troughs, *b*, *b*. An endway motion may be communicated to the distributing rollers if desired, as is well understood, for equalizing the ink.

The operation of this apparatus is as follows:—The trough rollers by turning partly in the ink receive the ink upon one side of them, and on the other side delivers it to the small taking rollers, which in turn delivers it to the distributing rollers. By means of the two distributing rollers the ink is taken from the two small taking rollers and delivered to the four inking rollers, which, by revolving upon the surface of the type, communicate the ink to them in suitable quantities.

I would remark, that the inking apparatus forms no part of the invention, and may be arranged according to the judgment of the workman. H, H, are two joints, by means of which a part of the side framing, and the last or upper impression or platen cylinder, C, may be raised or thrown back, so that the lower type cylinder, B, may be taken from its bearings for the purpose of making up a new form of type or adjusting the old one. I, I, I, I, are

four leading or lifting rolls or wheels, which raise the paper in its course to the folders, K, K, K. The last or second pair of these leading rolls is placed at an angle, as shown in the drawings. K, K, K, are three folders, by which the paper is folded in its course to the rotary-knife. These folders are three pieces of sheet-iron, or other convenient material, placed at angles, as shown in the drawings. L, S, are two cylinders, which run together and complete the folding, and, as will be hereafter shown, cut off the paper. N, N, are two joints, by which the cylinder, L, is thrown back, in order to adjust the paper, if necessary. O, is a screw which regulates the pressure of the cylinder, L, upon the cylinder, S. The type cylinders, B, B, and the impression or platen cylinders, C, C, are geered together and made to run with the same surface speed by the toothed wheels, D, D, and the whole machine is driven by turning the driving-shaft, E, by steam or other convenient power. The inking and distributing rollers are turned by the two small toothed wheels, U, U, working into two of the toothed wheels, D, D. The cylinders, L, S, are made to run with the same surface speed as the type and impression cylinders by the shaft, P, which is geered to and runs with the same speed as the driving-shaft, E. The trough rollers, *d*, *d*, are driven by the mitre-wheel, *f*, on the cross or diagonal shaft, G, which is worked by another mitre-wheel or screw on the driving-shaft, E. On each end of the shaft, G, is a bevel pinion working into a bevel-wheel on the trough roller shaft. F, F, are the driving-wheel, and the driving-crank handle, which are fixed to the driving-shaft, E. R, R, are toothed wheels, by which the two perpendicular or folding cylinders, L, S, are made to run together with the same surface speed. T, T, T, is a stationary knife or blade, used in connexion with the revolving knife, V, V, V, which is placed upon the cylinder, S. These two knives or blades, T, T, T, and V, V, V,

cut against each other at each revolution of the cylinder, S.

The paper, after having passed between the last pair of printing cylinders, is raised by the first pair of rolls or wheels, I, I. These rolls are placed at about one quarter of the width of the paper from the two edges, and when on the rolls the edges of the paper drop to a certain extent by their own weight. The paper is then passed over the second pair of rolls or wheels, I, I, which are placed nearer to each other than the first pair, as shown by the drawings, and at the same time the paper is passed under the depressing roll or wheel, J. The centre or middle of the paper passes under the middle folder, K, which is fastened at the top, and the sides of the paper pass over the two outside folders, K, K, which are fastened at the bottom. The paper is drawn over the rolls and past the folders by the cylinders, L, S, then between the stationary knife, T, and is cut off by the revolution of the cylinder, S, by the knife or knives placed upon that cylinder.

If it is required to cut the paper more than once during each revolution of the printing cylinders, two or more knives may be placed upon the cylinder, S, at the requisite distances apart, or the cylinder, S, having one knife may be geered so as to run two or more times as fast as the printing cylinders.

Figs. 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, and 16, represent the different machines and articles for adjusting the type upon the type cylinders, and also the manner of so adjusting the type.

Fig. 10, shows a single type in two positions. Y shows the taper of the type from one end to the other. It is by this taper or slant that the type are made to fit the cylinder.

It should be stated, that the type made for one particular diameter of cylinder cannot be used to advantage upon a cylinder of any other diameter. Different sets of

type should, therefore, be made for cylinders of different diameters.

In figure 10, z, shows the projection and indent of the type, by which one type is made to fit into another. (1), is the indent upon one side of the type, and, (2), is the projection upon the other side of the type. It may be seen in Y, that the taper of the type is made on the sides corresponding with the top and bottom of the letters. The moulds used for making such type are of the ordinary kind, varied, however, so as to produce the taper in the manner mentioned, and also for making the indent and projection (1) and (2).

Fig. 8, represents an external and a sectional view of a column rule or ring, which is placed between each column of type. It has upon one side a circular indent, (1) (1), corresponding to the projection, (2), of the type, and on the other side a projection, (2), corresponding to the indent, (1), of the type. The outer edge of this rule may be formed so as to produce a continuous line, or by having gaps like that represented from (3, to (4), may produce short lines with spaces between them; or, if no lines are required, then the rule or ring will not be so wide as to come in contact with the paper.

Fig. 7, shows the common stick now in use for setting together or composing type, with the improvements by which it is adapted to the setting up of tapering type for cylinders. The improvement consists in having the bottom of the stick curved to suit the particular cylinder for which it is intended, as the curve must be different for cylinders of different diameters. The curve is shown by W, which is an end view of the stick.

Fig. 16, shows the external view of what I call "the grab," a machine, as will hereafter be shown, for placing a column of type upon the cylinder. (5), is a drum made of brass or of any other suitable material, the inside diameter of which is just equal to the outside diameter of a ring of type. (6) (6), are springs placed upon the outside of the

drum, (5), and protruding a little below the base of the drum, where they are bent inwards at, (7) (7), at an angle, as shown. (8), is a ring of brass or other suitable material, which fits around the drum, (5), and outside of the springs, (6) (6). The tendency of the springs is outward, but when the ring, (8), is pushed down to the bottom of the drum, the points of the springs, (6) (6), are pressed inwards, as is shown in figure 15. (9) (9), are the handles of the grab fastened to the drum, (5), and (10) 10), are the handles of the ring, (8).

Fig. 14, shows a broken view of a lead or space, which is sometimes placed between two lines of type, to throw them apart or separate them, it having the indent and projection (1) (2), at the ends. *h*, is the end view of such lead or space.

Fig. 12, shows a broken view of a cross rule, which forms a line from one column rule to another, parallel with a line of type. This cross rule has a projection and indent, (2) (1), corresponding with those in the type and column rules. *g*, shows the end view of such cross rule.

The leads or spaces are commonly made of type metal, and the cross rules of brass, but any suitable material may be used.

I would remark, that the cross rules and leads (like the type), which are made for a cylinder of a particular diameter, cannot, owing to their taper, be used with advantage upon a cylinder of any other diameter; different degrees of taper being required for cylinders of different diameters.

Fig. 9, is the end view of a block used for separating the type in certain places, for the purpose of forming blank spaces upon the paper, called margins. The taper of the sides is similar to that of the type, and it has an indent, (1), and a projection, (2), to correspond with the type; its length being equal to the width of a column or ring of type. The projection, (11), fits into a groove made in the type cylinder, as shown in figures 4, (12).

(12) 12). This groove is made from end to end on the type cylinder, and the projections, (11) (11), upon the blocks and also upon the column rules by fitting into it, firmly secure the columns of type from getting out of their true relative positions.

Fig. 11, is a broken side view of the block just described.

Fig. 13, shows the end of a block without the projection, (11). It is used only where two or more blank spaces or margins are required during a single revolution of the type cylinder, which would seldom occur except in book printing.

In order to form blank spaces or margins for book or other printing, in the opposite direction; rings of any suitable thickness are placed upon the cylinder at the required place or places. A section of one of these rings is shown in figures 4, (13 13). The manner of arranging the type and of adjusting them upon the type cylinder is thus performed. Each type, when placed in the stick, is placed with the projection, (2), to the right-hand, as shown by red lines in figure 7, by which the type fit and set into each other. When the stick is full, the type are taken out in a body and placed sidewise upon a ring or column rule, figure 8, which may first be placed upon a small cylinder, figure 15, (14), of a length equal to about the width of a column of type. The column being full, forms a complete ring of type, figure 5. The column of type is then taken by means of the grab, figures 15, and 16, and slid to its proper place upon the type cylinder.

For the purpose of putting a ring or column of type upon a type cylinder, the grab is placed over and slid down to the bottom of the ring of type on the small cylinder, figure 15. The ring, (8), is then pushed down, pressing the springs inward, the points of which, catching under the column rule or ring, figure 15, the type are held between that ring and the guage rule, which is placed and adjusted, as shown in figure 15, (15) (15) (15). The

column or ring of type being thus held, is raised and placed upon the printing cylinder, which is securely held in a perpendicular position to receive such column or ring of type. The type cylinder being full, a round plate of iron or other suitable material is placed at the end of the type cylinder, and pressed against the type by means of nuts and screws, figure 6, (16) (16). Each ring of type and each type in each ring fitting into the next ring of type by means of the column rules or rings, or into the next type, the whole form is firmly secured to the type cylinder by the pressure occasioned by the nuts and screws upon the aforesaid plate.

Fig. 6, is an end view of one of the type cylinders ready to be put upon its bearings in the press: the rim which holds the type at the other end of the cylinder being firmly fixed to the cylinder, or forming a component part thereof.

Fig. 5, may be considered to represent either a sectional view of the type upon the type cylinder, or an end view of a column or ring of type ready to be placed upon the type cylinder.

Fig. 4, is a broken front view of a type cylinder, with a sectional view of the type adjusted thereon, and a sectional view of the plate which secures them. The form or collection of type here represented is most suitable for newspaper printing. By close observance of the drawing, the column rules, rings, cross rules, &c., may be distinctly seen together, with the manner in which each alternate indent and projection, (1) (2), fit each other from one end of the cylinder to the other.

Fig. 17, is an end view of a proof-press, used in connexion with the rotary printing-press, or independently of the rotary printing-press.

Fig. 18, is a side view of the press aforementioned The tapering type are used: the bed of the press being, in fact, like part of the type cylinder used in the rotary printing-press. If used as a hand-press, the type may be

secured in the same manner as upon the rotary-press, i.e., by a plate screwed on at one end, but no grab will be necessary for placing the type upon the press, as it can be done by hand without difficulty. The annexed drawings represent the press, as forming about one-third of a circle, which I believe to be the most convenient size. The drawings also represent it as a proof-press having a galley of type upon it.

(17) (17), is the framing of the machine. (18) (18), is the bed of the press upon which the type is placed. (19), is an impression or platen cylinder, similar to those for the rotary-press; the shaft of which has its bearings in moveable sockets, (20) 20), which are moved up or down to vary the pressure upon the type, by the screws, (21) (21). The levers, (22) (22), hold the impression or platen cylinder, (19), at a suitable distance from their own axes; those axes, (23) (23), being the ends of the bar, (24). The stops or rests, (25) (25), are for the levers, (22) (22), when they are left in the position indicated by the dotted lines in fig. 17. A handle, (26), is applied, by which the impression or platen cylinder is moved from one side to the other of the machine. The action of this machine is as follows:—The type is placed upon the bed of the press while the impression cylinder is in the position indicated by the dotted lines, and are inked by a hand inking roller.

The paper is then laid upon the type, as shown by the red line. The impression or platen cylinder is then pulled or drawn over from one side of the press to the other, by means of the handle, (26), giving a pressure in passing over the surface of the type. There being neither front nor back side to this press, the impression cylinder may be left resting on the stops on either side, until wanted again. If necessary, a set of teeth may be introduced near the edge of the bed of the press, and a toothed wheel may be placed upon one end of the impression or platen cylinder; the teeth upon the wheel to work into

the stationary teeth. This would prevent blurring or imperfect printing, and also the danger of spoiling type. As a proof-press, a galley in which to place the type would be convenient. The only difference between the galley required and the common galley, is the curve given to the bottom of it, so as to make it fit upon the bed of the press. The type may be locked up or secured in the galley in the common manner with side and foot-sticks and blocks, or by screws through the sides of the galley frame, or in any other convenient manner. The press may be made of a sufficient width to contain several different galleys, a proof from the type contained in each of which may be taken at the same moment.

Fig. 18, represents a machine for damping and packing the paper in a suitable manner for the rotary printing-press. (27) (27), is a stout table upon which the whole machine is placed. (28), is a water-box, placed upon four wheels, of which, (29) (29), represent two. The wheels run upon tracks truly adjusted, of which, (30), represents one. (31), is a roller, covered with cloth or blanketing, which by turning partly in the water, is kept quite damp. (32), is another roller similar to the last one, but is entirely out of the water; and being supported at both ends by iron bars, which are fastened to the water-box, (28); it rolls or turns against the roller, (31), and from it receives its dampness. The water-box, (28), and the rollers, (31), and (32), are drawn forward on the track, (30), by the weight, (33), which is attached to the box by a cord running over the pulley, (34), but are held back by the shaft, M, belonging to the rotary printing-press, and which is supported and held firm as well as the shaft (35), by iron bars, similar to (36).

The dry paper is received upon the shaft, (35), which is placed in its bearings. One end of the paper is then passed around the shaft, M, to which the power is applied. The red lines show the paper as already partly wound upon this shaft. The rollers, (31), and (32), are driven

by the friction caused by the weight, which is also the means of packing the paper tightly around the shaft, M, by pressing the roller, (32), against it. As the roll of paper upon the shaft, M, increases in size, it forces the water-box and rollers backwards, until the roll of paper is completed, when another is put in its place. Several rollers similar to (32), may be placed one against another, the last one pressing against the shaft, M, so as to regulate the required dampness.

NOTE.—In the rotary printing-press, common type, but made with a suitable taper, may be used, being fixed upon the cylinder in the method described. The four-cylinder press, B, B, C, C, above described, may be changed to one or two cylinders, B, C, by throwing back the last impression cylinder, and removing the corresponding type cylinder, as described. In such case the machine would only print on one side of the paper.

In some cases I apply an endless apron of blanket to the second impression cylinder, in order to prevent ink received thereon injuring succeeding impressions.

If the folding apparatus is not required to the press, it may be left out, and the cutting apparatus placed horizontally, so as to cut off the sheet without folding.

Having thus described the nature of the inventions, and the manner in which the same is to be performed, I wish it to be understood, that I do not confine myself to the precise details, provided the peculiar character of either of the improvements be retained: but what I claim is,—

First, the peculiar form or shape of the type, with indents and projections, as described, and its combination with the taper on the sides, corresponding with the top and bottom of the letter.

Secondly, the construction of type, having the taper on the sides corresponding with the tops and bottoms of

the letters, whether with or without the indents and projections, (1) and (2), as above described.

Thirdly, the method of securing the type above-mentioned to the cylinder, by means of the indents and projections, in combination with circular column rules and rings.

Fourthly, the method of folding and cutting the paper in the manner described.

Fifthly, the mode of constructing the hand-press for obtaining proofs, or otherwise.

Sixthly, the mode of constructing the machine for placing a column or ring of type upon the type cylinder.

Seventhly, the mode of constructing the machine for damping and packing the paper, preparatory for printing. —In witness whereof, &c.

MOSES SPERRY BEACH.

Enrolled September 23, 1842.

Specification of the Patent granted to THOMAS HENRY RUSSELL, *of Wednesbury, in the County of Stafford, Iron Tube Manufacturer, and* CORNELIUS WHITEHOUSE, *of the same place, for Improvements in the Manufacture of Welded Iron Tubes.*—Sealed March 7, 1842.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.— Our invention relates to improvements in welding the joints or seams of wrought-iron tubes, when made by external pressure, by passing the iron in a welding state between dies or through holes, and the improvements consist of a means of employing internal support, and in such manner that the instrument which gives the internal support being introduced into a partly formed tube, is caused to pass with the tube through the dies or holes used, by which the requisite external pressure is obtained; and when the weld is completed, the instrument used for

giving internal support, owing to its being of small diameter when compared with the diameter of the finished tube, may readily be withdrawn by causing the welded tube to be pressed into a cylindrical form. And in order that our invention may be most fully understood and readily carried into effect, we will proceed to describe the drawings hereunto annexed.

Description of the Drawings.

a, Fig. 1, represents an end view of a skelp of iron turned into the shape shown. This skelp being heated to a light or moderate welding heat, is drawn through the tongs, *b*, fig. 2; these tongs have a bell or enlarged mouth opening, and the upper part at *c*, is so sunk as to cause the turned skelp of iron to assume the shape shown at fig. 3, one edge of the skelp touching the inner surface at the other edge of the skelp, which is caused to overlap, as is clearly shown at *d*, and a partial weld is thus effected. A cylindrical bar or rod of iron, *e*, is then introduced into the interior of the skelp or partly formed tube, and the skelp or partly formed tube is to be heated to a welding heat, and then, by means of a draw-bench, the tube, with the instrument, *e*, within it, is drawn through the hole in the dies or tongs, fig. 4, the pressure being in the direction of the dotted line, *y*, *y*, by which the metal of the joint or seam will be pressed together, and the instrument, *e*, which will not have become very highly heated, will be securely held in the tube. The tube being kept at a welding heat is turned round slightly, and again drawn through the hole of the die or tongs, fig. 4; in this instance the principal pressure will, however, be in the direction of the dotted lines, *z*, *z*, in fig. 5, and the seam or joint will be pressed on a little on one side of the central line thereof; then the tube is again drawn through a hole in the tongs or dies, fig. 4, which are caused to give the principal pressure a little on the other side of the central line of the seam or joint, as

is indicated by the dotted lines, *x*, *x*, fig. 5, the tube being turned in such manner that the tongs may grasp it in the positions indicated by the dotted lines, *x*, *x*, and, *z*, *z*, by which means a very effective lap joint and weld will be obtained to the tube. We prefer to use three pair of tongs, fig. 4, for this purpose, so that the tongs used for each time of drawing may be immediately put into water, and any scale which may adhere removed. The tube is then drawn through the hole in the die or tongs, fig. 6, which causes the tube to assume a cylindrical shape; and owing to the smaller diameter of the rod or bar, *e*, it will be immediately released, and may readily be withdrawn from the welded tube.

We would remark, that we prefer the pressing dies used to be in the form of tongs, owing to the cheapness of their construction and the facility they offer for being cleansed by dipping them in water after each time of use, when the scale (if any adhere) may be readily removed; such construction of dies also allowing the workman to change from one size of tube to another more readily; at the same time we do not confine ourselves to the use of dies in the form of tongs as grooved rollers or other dies, such, for instance, as are described in the specification of Cornelius Whitehouse, of the 26th day of July, 1825, may be used for performing the welding process when the internal support, *e*, has been introduced; but we consider hand dies in the shape of tongs to be the best. The workman in using the tongs rests them against a suitable stop formed on the draw-bench, and he causes the parts of the die to close as the tube begins to pass through the die.

We would also remark, that the dies and manner of using them, shown and described, are very similar to those now used in the making of welded iron tubes, according to the specification of the former patent granted to the said Cornelius Whitehouse, they differing only in the shape of the bell mouth given to them respectively.

And we would wish it to be understood, that we do not claim the using of such dies when uncombined with the use of an internal support, *e*, similar to that shown in the drawing, nor do we claim the use of an internal support when using external pressure in welding iron tubes, unless the instrument for giving internal support be such as to pass with the tube through the holes or dies used, and offer internal support from end to end of the seam or joint of the tube which is to be welded, the bar or rod, *e*, being of such diameter in respect to the tube, that on shaping the tube, the bar or rod, *e*, shall be released, as before mentioned, so as to be readily withdrawn, owing to the smallness of the diameter when compared with the tube welded thereon. It will therefore be seen, that the tube does not move or slide on the bar or rod, *e*, when the process of welding is being performed. In order to obtain lightness of the instrument, *e*, used for giving internal support, we prefer that it should be hollow, and we have used strong welded iron tubes for this purpose. The instrument, *e*, is longer than the tube welded thereon, and protrudes a short distance through at each end; and care is to be observed in raising the tube to a welding heat, that the ends of the partly-formed tube, and also of the instrument, *e*, are to be kept out of the strong action of the fire, in order to prevent those parts being raised to a welding heat. For this object we have a hole at the back of the furnace for the end of the instrument, *e*, to protrude through, and for the end of the tube to enter, so that the heat is applied to the tube only, and not quite up to the end thereof; and when the fire or furnace is not sufficiently long to heat the length of tube desired at one heat, then we first make the tube in the manner described above for a part of the length of the skelp, and when the same has been cooled, we insert the instrument, *e*, and finish the other end of the skelp by raising it to a welding heat, and drawing it in like manner to the first end of the skelp. The tube thus made is subsequently raised to

a bright red heat, or a moderate welding heat, and is drawn through a pair of dies rather less than those at fig. 6, which slightly reduces the diameter of the tube, and brings it to the size desired; the tube is then to be straightened as heretofore, and the ends cut off, when the tube will be complete. We prefer that the instrument, *e*, should simply be straightened, and not cooled down between each succeeding tube in which it is used, it being desirable to keep the instrument, *e*, hot. We would observe, that this invention is particularly applicable when thin welded iron tubes are desired, such as for the tubular flues of locomotive or similar steam-boilers, for which purpose we are now using iron of No. 14, of the wire guage, and we are now making such tubes from one and a-half to two inches diameter; but these dimensions may be varied. The drawings show the size of the bar or rod used when making tubes of two-inch internal diameter; and it will be evident that the diameter of the bar or rod, *e*, will be varied according to the size to be made.

Having thus described the nature of our invention, we would wish it to be understood, that we do not confine ourselves to the various details shown and described, provided the peculiar mode of applying internal support, combined with the welding of wrought-iron tubes by external pressure be retained, whereby a bar or rod, *e*, though of much smaller diameter than the tube welded thereon, is caused to give efficient support to the seam or joint of a tube when being welded by external pressure, and whereby the bar or rod, *e*, is caused to pass under pressure with the tube, and be released after the weld is obtained by the subsequent shaping of the tube, as above described.—In witness whereof, &c.

THOMAS HENRY RUSSELL.
CORNELIUS WHITEHOUSE.

Enrolled September 7, 1842.

Specification of the Patent granted to Henry Smith, *of Liverpool, Engineer, for Improvements in the Construction of Wheels and Breaks for Carriages.*—Sealed March 10, 1842.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—The first part of my invention relates to a mode of making railway wheels, by combining cast-iron centres, wood felloes, and wrought-iron or steel tire, and in such manner that the parts of wood of which the felloes are formed, may be caused to be forced out and separated by means of wedges, in order to expand the circle of wood of which the felloe of a wheel is composed; and in order that my invention may be fully understood and readily carried into effect, I will explain the drawings hereunto annexed.

Description of the Drawings.

Fig. 1, represents the side view of a wheel constructed according to this part of my invention, being partly in section.

Fig. 2, shows a transverse section of the wheel.

Figs. 3 and 4, show another side view of a wheel partly in section, and a transverse section of the mode of separating the parts of the wood felloe being somewhat different to that at figs. 1 and 2.

Figs. 5 and 6, show a side view partly in section, and a transverse section of another arrangement of wheel, differing from those shown in the previous figs. only inasmuch as to the means of forcing out the parts of the wood felloes.

Figs. 7 and 8, show a side view and section of another arrangement of means for forcing out the parts of the wood felloe. In all these figures the same principle of construction is retained, that is to say, the centre part of

the wheel, *a, a*, is of cast-iron, and should be made in one casting; the wood felloes are made in several parts, *b, b, b*, as is shown, and the tire is of steel or wrought-iron. *c, c, c*, are screw-bolts passing through the tire, the wood felloes, and through the outer ring of the cast-iron centre of the wheel; and it will be seen that the only variation to be found in the different wheels shown in the drawing, is as to the means of forcing the parts of the wood felloes so as to increase the diameter, and thus securely hold the tire; and in all cases an annular filling piece is used between each pair of the parts of the wood felloes, *b*, and it is by forcing these angular pieces, *d, d*, outwards from the centre of the wheel, that the tire is at all times securely held, and the parts of the wheel retained together. In figs. 1 and 2, the angular pieces, *d, d*, are forced outwards from the centre of the wheel by means of the screws, *e*, and the wedging-blocks, *f*, as is shown. In figs. 3 and 4, the pieces, *d, d*, are each divided into two parts, and a wedge, *g*, being introduced between them, causes them to be separated, thus separating the parts of the wood felloe. In figs. 5 and 6, the angular pieces are forced outwards by means of the screws and nuts, *h, i*, the screws entering hollow spokes, and the square heads of the screws enter square holes in the angular pieces, the nuts working in openings of the castings of the centre portion of the wheel, as is shown. In figs. 7 and 8, the angular pieces, *d*, are forced outwards by wedges, which wedges are moved by screw-nuts working on screws formed at the ends of the wedges, *j*, as is shown. It will thus be seen that the wheels constructed according to my invention, consists of a centre casting or wheel, having around its periphery a series of wood blocks, *b*, producing a felloe, which are separated by the parts, *d, d*, in order to retain the tire. And I would have it understood, that I do not confine myself to the precise details shown.

I will now describe another part of my invention, which

relates to a mode of applying steel on the working surface of railway tires, and consists in rolling the iron tire into the form shown at fig. 9, there being a groove, as is shown at *z*, *z*, and before passing the hot bar through between the rollers, to bring the bar to the proper shape, shown at fig. 10, I introduce into the groove a bar of steel, which is bevilled at its sides, as is shown at, *y*, *y*, such bar being by preference cold. I then pass the iron bar, together with the steel, between the rolls, the grooves in the rolls being of a proper figure to complete the shaping of the bar of tire, by which means I close the edges of the groove, *z*, over the bevilled sides of the steel bar, and this, together with the shrinkage of the hot iron, will securely hold the steel in its place. I would remark, that I am aware that steel has been applied in various ways to the working surfaces of railway tire. I do not, therefore, claim the application of steel generally, but this part of my invention is confined to the mode herein described of applying steel.

I will now describe the part of my invention which relates to the application of breaks to the wheels of railway carriages, and the improvements consist in working breaks in such manner that the engineer may, when desired, cause the breaks to act on their respective wheels, in consequence of their being connected by suitable apparatus to one of the axles of locomotive engines, or of the tender.

Fig. 11, represents a side view; and

Fig. 12, a plan of such parts as will enable me to explain one mode of carrying out this part of my invention, *a*, represents the axle of a locomotive engine, or of a tender, and, *b*, *b*, represents two of the wheels of a railway carriage. *c*, *c*, are the breaks, which are of an ordinary construction. These breaks slide on the bar, *d*, which is affixed to the axle-boxes, and move with them up and down, as is well understood. *e*, *e*, are the links, or connecting-rods, which by means of the arms, *f*, *f*,

affixed on the axis, *g*, when that axis is moved, either by the means at present resorted to or by the apparatus hereafter explained, will cause the links or rods, *e*, *e*, to force the blocks, *c*, *c*, against their wheels. *h*, is the rod by which the breaks are worked by a person riding with the particular carriage; the remainder of the apparatus for that purpose, however, is not shown, but the same is well understood. On the axis, *g*, is affixed an arm, *i*, to which the link or connecting-rod, *j*, is attached by a pin joint, the other end of the rod, *j*, being attached to the quadrant, *k*; this quadrant is put in motion by means of a revolving rod, *l*, which receives motion from one of the axles of the locomotive engine or of the tender, by means of the screw, *m*, which takes into and moves the quadrant, and thus causes the axis, *g*, to move, and thus bring the breaks into action. There is a similar rod, *l*, to each carriage, and also a quadrant and connecting-rod, *j*, the revolving rods, *l*, being connected together by means of universal joints, at *n*, and the revolving rods, *l*, are made in parts so as to slide into each other, to compensate for the varying distances of the carriages from each other. The parts of the rod, *l*, though they slide into each other, they revolve together, as is shown at *o*, *o*; and it will be seen that there is a slot in the end of the rod, *j*, which allows of the breaks being used by the ordinary apparatus attached to the carriage, without calling the apparatus into action which is in connexion with an axle of the locomotive engine or of the tender. The requisite rotary motion is communicated to the rods, *l*, by means of friction surfaces, *p*, *q*, one applied to the axle of the locomotive engine or of the tender, and the other to the rod, *l*, which comes next thereto; and a lever is applied to slide the friction surface, *q*, into and out of contact with the surface, *p*, and thus by the friction of the surfaces, give motion to the rods, *l*, of the train of carriages; and when it is desired to put off the breaks, the other friction surface, *r*, is to be brought into action,

which will reverse the motion of the rods, *l*, and then the friction surfaces are to be left in such a position as not to act on the friction surface of the rods, *l*.

I will now describe another arrangement of apparatus for carrying out this part of my invention.

Fig. 13, shows a side view of this apparatus. *j*, is a bar or connected rod, which is connected with the arm, *i*, by a pin joint, there being a slot in the bar, *j*, to allow of the arm, *i*, moving separately when the breaks are being put in motion by the ordinary apparatus attached to the particular carriage. The bar, *j*, of each carriage is attached to the bar, *j*, of the next carriage by means of an apparatus consisting of the following parts:—(1) (1), are two links attached to the ends of each carriage by pin joints, their other ends being attached by pin joints to rods, (2) (2); and the rods, *j*, *j*, of two carriages are connected together by means of the links, (3) (3), which are attached by pin joints to their respective bars, *j*, *j*, and to each other, and to sockets, (4) (4), by pin joints, as is shown, the sockets, (4), sliding on the rods, (2) (2); hence the two carriages may vary in their distance apart, and yet any movement given to the first bar, *j*, will be transmitted to all the bars, *j*; and I prefer to give motion to the first bar, *j*, in the following manner: on the axis, *a*, of the locomotive engine or of the tender, is affixed a drum, *s*, and the chain, *t*, passes partly around such drum, *s*, and is then attached to the lever, *v*, the other end of the chain being attached to a short bar, *j*, which connects the apparatus above described with the bar, *j*, of the first carriage. When the lever, *v*, is in the position shown, the breaks will be out of action, but immediately the lever, *v*, is moved, and causes the chain to bend on the surface of the drum, *s*, that drum will by friction move the chain on the bars, *j*, and thus bring the breaks into action. I would remark, that I do not confine myself to the details shown in carrying out this part of my invention, as variations may be made therein, and the character of

apparatus used for moving the breaks employed, may be varied, provided the peculiar nature of this part of the invention be retained, whereby one of the wheel axles of the locomotive engine or of the tender be brought to act on the breaks of a train of carriages. And I would have it understood, that what I claim is,

First, the mode of separating the parts of wood felloes of railway wheels by means of wedges forced outwards in radial lines, in a direction from the centre of the wheel, as described in respect to figs. 1, 2, 3, and 4.

Secondly, I claim the mode of separating the parts of wood felloes of railway wheels by means of two wedge pieces between each two parts of the wood felloes, such wedge pieces being caused to separate by a wedge, as described, in respect to figs. 5, 6, 7, and 8.

Thirdly, I claim the mode of applying steel to railway tires, whereby the sides of a groove formed therein is pressed over bevilled sides of a steel bar introduced into such groove. And,

Fourthly, I claim the mode of working breaks by putting them into action by means of one of the axles of the wheels of the locomotive engine or of the tender, whereby the engineer may, when it is desirable so to do, cause the breaks to act on the wheels of the railway carriages of a train.—In witness whereof, &c.

HENRY SMITH.

Enrolled September 10, 1842.

Specification of the Patent granted to ALEXANDER ROUSSEAU, *of the Strand, in the County of Middlesex, Manufacturer, for Improvements in Fire-arms. (Communication from abroad.)*—Sealed February 15, 1842.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—This invention consists of a mode of constructing and

applying apparatus to fire-arms, which is to contain a number of detonating caps, which will be successively brought on to the nipple of the gun or other fire-arm by the act of cocking the gun or other fire-arm in such manner that the gun or other fire-arm may be repeatedly discharged according to the number of caps contained in the apparatus, without there being a necessity to place a cap on to the nipple with the finger. The chamber in which the caps are placed contains, for a single-barrel gun, about fifty caps, which are brought one after the other upon the nipple of the gun as it is successively discharged. This system may be equally applied to double-barrel guns. A great advantage arises in the employment of this invention in consequence of the saving of time which has been heretofore lost in putting on a cap after each discharge of the gun or other fire-arm, and the caps are so arranged that they cannot be improperly put on. Another advantage is, that the cap is always sheltered from the damp of the weather.

The drawings hereunto annexed represent the invention as applied to a double-barrel gun, and also show the details of the different parts. The apparatus containing the caps is placed near each side of the stock of the gun, so as to supply the nipple with caps, as required.

Fig. 1, represents a side view of a double-barrel gun, showing the apparatus applied thereto; and

Fig. 2, is a plan of the same with the butt end separate from the other part of the gun. A, is the plate to which the lock is fixed. This plate is attached to the stock of the gun at one end, and the other is joined to the barrels, B, of the gun. Upon this plate two tubes, D, D, move, each on a separate axis, such axes turning in holes formed in the plate, A, and the tubes are bent at their ends, as is shown, in order that they may deposit upon the nipple the caps which they receive from the interior. *g*, is a washer, placed between the projecting surfaces of the tubes, D, D, which work on axes, and enables the tubes,

D, to move together or separately with the greatest facility, at the same time that it keeps them in their proper places. A screw runs through the centre of this washer, and fixes into the plate, A. The figures 1 and 2, represent a gun half size; but figures 3, 4, 5, 6, and 7, represent several views on an enlarged scale of the plate, A, with the moveable tubes, D, D, and the washer, *g*. The plate, A, is fixed to the stock by means of the screw, *h*. The lateral movement of these tubes, D, is effected by means of a spring with two branches, *m*, *m*, which is represented separately at fig. 8. These branches are placed in a recess in the lower part of the plate, as is shown in fig. 14, which represents an under plan of the plate, A. The object of these springs is to force the ends of the moveable tubes, D, D, in a line with the nipple, h^2, h^2, each time that it should deposit a cap. It should be here observed, that although the apparatus is shown as applied to a double-barrel fire-arm, yet the action is perfectly independent of each other, so that one barrel only may be used without in any way affecting the other tube, D. On the plate, A, are two supports, *j*, *j*, which serve as a stop to the ends of the tubes, D, and prevent the caps which are contained in the tubes, D, from falling out.

Fig. 5, represents a side view of the plate, A, with the tubes, D.

Fig. 6, the end view of the plate with the barrels of the gun removed, in order to show the arrangement; and

Fig. 7, the other end of the plate, showing the opening, *l*, through which the caps pass from the chambers into the moveable tubes, D, to be deposited on to the nipples.

Fig. 9, shows one of the hammers of the lock, at *i*, and the interior of the part which strikes upon the nipple, by which it will be seen that part of it is cut away in order to disengage the parts of the cap after discharging the fire-arm.

Fig. 10, shows an end view of the inner part of this

hammer, *i*, with the part cut away, to give free passage to the pieces of the cap to fall away. The hammers, in striking upon the nipples, *h*², *h*², press the tubes, D, out of the way, by coming against the projections, D¹, the back ends of the tubes, D, being so formed that they are prevented being forced too far out by the springs. It will therefore be seen that when the hammer is pulled back, the spring will force out the tube, D, of the particular hammer, and cause the end of that tube, D, to come opposite the nipple when the coiled spring on the inside of the apparatus will force a cap on to the nipple, and, as before stated, on the hammer coming forward to discharge the cap, the tube, D, will be pushed out of the way, and allow of the hammer striking the cap. M, at fig. 14, represents a reservoir which contains a supply of caps. It is a hollow tube, having a screw bolt and ring at one end of it. It is placed in the interior part of the stock, in a place drilled or otherwise formed therein, for that purpose.

Fig. 14, shows an end view of the stock of the gun, showing the mode in which the reservoir, M, is placed therein. In the lower part of the stock are two holes which extend to the end of it, in a line with the moveable tubes, D. In each of these holes is placed a tube, P, which extends the whole of its length. This tube is shown at fig. 12. Into each of these tubes are put the caps, filled up to the orifice of the tubes, D, leaving sufficient room at the end opposite to the one where the tubes, D, are, for a rod to be inserted. This rod has wound around it a spiral spring, *r*, as shown in the drawing, fig. 13; and when the caps are placed in the tubes, P, P, the ends of the springs, *r*, will be pressed, and act by virtue of their elasticity upon the caps, in proportion as the caps are released by the discharge of the gun, and place them on the nipples, *h*², until they are all exhausted. The head of each rod, *q*, is placed at the butt end, and will be kept there by a sliding piece fixed to a small hook,

t. This arrangement is very simple, and readily allows of the caps being supplied.

Fig. 14, shows the mode in which this is done. The plate, V, which covers this part or end of the gun being withdrawn to show the interior, the plate, V, is shown at fig. 15, separately. When the caps in the tubes, P, are exhausted, the tubes, P, must be again filled for this purpose; the plate, V, being withdrawn for that purpose, which is done by pressing upon the bolt, *s*, which causes it to fly open. The stop piece, *t*, may then be removed, and the tubes withdrawn and filled as before, either from the reservoir or from any suitable deposit.

Having thus described the nature of the invention and the manner of performing the same, I would here remark, that although I have been particular in showing and describing the various details used, I do not confine myself thereto, as it will be evident that the peculiar character of the invention is the mode of using the tubes, D, combined with suitable apparatus containing a supply of detonating caps, and causing the tubes, D, to supply the nipples with caps, and then move out of the way of the hammer. And I would also remark, that although I have only shown a double-barrel gun, a workman will, from the description of the apparatus, aided by the drawings, readily apply the invention to a single-barrel gun or to other fire-arms. I would remark, that it will be evident that in place of using springs to force out the tubes, D, there may be a projecting surface applied on each of the tubes, D, to be acted against by the hammer in going back to cock the gun or other fire-arm, and thus bring the tubes, D, opposite the nipples to deliver caps thereon, and the movement of the hammers to strike the caps on the nipples would force the tubes out of the way, as before described. And further, as it will sometimes happen that caps will be introduced into the tubes, D, incorrectly, in such cases it would be desirable to have the means of removing the detonating cap which has been

introduced in the wrong direction, without withdrawing all the detonating caps from the butt-end of the fire-arm, and this may readily be accomplished by applying moveable stops to the tubes, D, which will keep them when in use in the correct position for putting on the caps, but when a cap comes up in an incorrect position, by removing the stop of the particular tube, D, that tube would be allowed to move beyond the nipple, and then the reversed detonating cap might be removed, and the stop again inserted, which would prevent the end of the tube, D, coming beyond the nipple.—In witness whereof, &c.

ALEXANDER ROUSSEAU.

Enrolled August 15, 1842.

Specification of the Patent granted to LOT FAULKNER, *of Cheadle, in the County of Chester, Calico Printer, for Improvements in the Mode of working Pumps and Valves, and which Improvements are also applicable to Fire-engines and other similar apparatus.*—Sealed April 11, 1839.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—My improvements in the mode of working pumps and valves, and which improvements are also applicable to fire-engines and other similar apparatus, consist,

Firstly, in the peculiar application and arrangement of certain segments of leather to pump-buckets, valves, plungers, or pistons, in order to constitute a perfectly light, elastic, and durable packing. And,

Secondly, in the application of such or similar pump-buckets, valves, plungers, or pistons to a certain arrangement and construction of apparatus in order to employ the same as a fire-extinguishing-engine, ship's-pump, garden-engine, or any other similar apparatus, wherein

such pumps, buckets, valves, plungers, or pistons, may be used with advantage. But in order that these improvements may be more particularly explained, I have attached to these presents a sheet of drawings, representing views of the same, and also their application to the working of pumps or any similar apparatus.

Description of the Drawings.

Fig. 1, represents an elevation of a pump-bucket.

Fig. 2, a section taken through the middle of the same.

Fig. 3, a plan or top view. And,

Fig. 4, a section taken through the bucket at the red line in figure 2. *a, a,* is the piston-rod or plunger; *b, b,* the buckets; *c, c, c, c,* several segments of leather primed, or otherwise fastened together, to form a deep ring, and left somewhat short of meeting at their extremities, in order that they may be elastic, and spring outwards tightly against the sides of the pump-barrel. *d, d, d, d,* are other similar segments of leather forming another ring or segment. d^1, is a slight spring of brass or other metal to assist the elasticity of the leather segments. *e, e,* is a tube or lining of leather, capable of being slightly compressed in order to allow of the segments, *c,* and *d,* being held or pressed closely together by the cross head, *f, f,* and upper ring, *g, g, g,* the valve or water-way is shown at *h, h.* The application of these improvements to fire-engines and other similar apparatus is shown in the longitudinal and transverse sectional figures, 5 and 6, wherein *a, a,* represents the engine-framing or water cistern, *b, b, b,* three pump-barrels worked in connexion with each other by means of a three-throw crank shaft. *c, c, c,* the guide or parallel lines, *d, d, d,* and the pump-rods, *e, e, e.* To the lower extremity of these pump-rods or plungers the improved mode of working the pump is shown, *f, f,* being the peculiar construction of leather-packing, as above described. *g,* is the entrance or suction-hole pipe; *h, h,* the water-way to the pump-

barrel; and *i*, *i*, the discharge-pipe to the running-hose or branch end.

I would here remark, that in the application of these improvements to the pumping of acids or other corrosive liquids or waters, I employ alternate segments of brass and leather in the composition of the packing-rings or segments, *c*, and *d*, and also substitute a lining of thin brass divided into four parts instead of the leather-tubes, *e*, *e*.

Having now fully described the nature of my said invention and the manner in which the same is to be performed, I desire it to be understood that I claim as my invention (and which is secured to me by virtue of the above-recited letters-patent), the peculiar construction and arrangement of the pump-bucket, valve, plunger, or piston, in working pumps and valves, and also its application and use in the manner and for the purposes represented in the accompanying drawings, and herein particularly set forth.—In witness whereof, &c.

LOT FAULKNER.

Enrolled October 11, 1839.

Specification of the Patent granted to JULIUS SEYBEL, *of Golden-square, Westminster, in the County of Middlesex, Manufacturing Chemist, for Improvements in the Manufacture of Sulphate of Soda and Chlorine.*—Sealed March 31, 1842.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention relates, First, to improvements in the manufacture of sulphate of soda by decomposing common salt by sulphuric acid, in closed vessels of lead or lined with lead, having heat applied externally. And,

Secondly, my invention relates to a mode of manu-

facturing chlorine, by employing the vapours of muriatic acid, to act on manganese immersed in water, such vapours being conducted below and permitted to escape upwards through the water and manganese. And in order that my invention may be readily and fully understood, I will proceed to describe the drawing hereunto annexed, and the processes as performed by me.

Description of the Drawing.

The drawing represents a section of a leaden vessel or retort, with suitable means for applying external heat thereto, and it also shows the apparatus employed in carrying out the second part of my invention, so that the vapours of muriatic acid, as they are evolved from the decomposing process, are immediately used in the manufacture of chlorine. *a, a,* represents the leaden vessel or retort, in which the process of manufacturing sulphate of soda is performed by decomposing common salt by sulphuric acid. *b,* is a manhole with a cover, by which the charge of common salt is thrown into the vessel or retort, *a, a.* The cover being affixed securely by clamp-screws or otherwise when the process of decomposition is going on. *c,* is a pipe leading to the chimney, there being a valve to close such pipe when the process of decomposition is being performed. *d,* is a pipe leading to a reservoir or vessel containing sulphuric acid of specific gravity, 1·71, such pipe having a valve to close it, when the proper quantity has been run into the vessel or retort, *a, a,* as is clearly shown in the drawing. *e,* is an outlet for running out the charge, there being a cover of lead, *f,* securely retained by the iron-frame, *g,* which is screwed securely in its place by the screw, *h,* passing through a fixed arch bar, *i.* The retort or vessel, *a, a,* is placed in an iron vessel, *j, j,* which contains oil or other suitable material to act as the heating medium, and the vessel, *j,* has a false bottom or frame, *k,* which is perforated so as so allow the heating medium to come in

contact with the bottom of the vessel or retort, *a*, *a*. The vessel, *j*, is heated by a fire or furnace at *l*, as is shown, and there should be a damper in the flue leading to the chimney in order that the heat of the fire may be readily under command. The drawing shows the retort or vessel, *a*, *a*, to be made of thick plates of lead, which are joined together by melting the surfaces of the joints and melting other lead therewith so as to form solid joints, as is well understood. But I would remark, that although I prefer the vessel, *a*, *a*, to be wholly of lead, and to be so made as to be of sufficient strength for the process, yet the vessel, *a*, may have an iron bottom, and if desired thinner lead might be used with an external strengthening of iron, my object being that the interior of the vessel or retort, *a*, *a*, acted on by the acids, shall be of lead. The temperature to which the vessel or retort, *a*, *a*, is to be heated is never required to exceed 330 degrees of Fahrenheit, and the workman should have a thermometer or thermometers in the bath or heating medium, in order to see that the temperature does not rise above such temperature, and the heat should be gradually raised till it gets up to 300 degrees of Fahrenheit, and there kept till the process is nearly complete. In carrying on the process of decomposition I charge the vessel or retort, *a*, *a*, with twenty cwt. of common salt, and then having fixed the cover over the manhole, I run in thirty cwt. of sulphuric acid (1·71), the valve in the pipe to the chimney being open whilst running it in, but the valve is to be closed so soon as the sulphuric acid is run into the retort or vessel, *a*, *a*, and then the vapours of muriatic acid will flow through the pipe, *m*, into the vessel, *n*, in order to produce chlorine. The workman is to be careful to damp the heat of the fire if, on listening at the pipe, *m*, there appears to be any going off of liquor, which a little practice will enable him to judge of, and if the damping of the fire is not sufficient, then he is to open the valve of the pipe into the chimney for a short time. The neces-

sity for this should, however, be avoided by attention and care.

I will now proceed to explain the nature of the second part of my invention, and the means pursued by me in performing the same. In doing so I would first remark, that I am aware that it has before been proposed to use the vapours of muriatic acid to act on manganese moistened with water. For this object it was proposed to fill a vessel with lumps of manganese and then apply small streams of water to keep the surfaces of the lumps moistened, whilst the vapours or gas of muriatic acid was to be passed amongst the lumps of manganese, but such plan never succeeded. I do not, therefore, claim as this part of my invention the right of applying the vapours or gas of muriatic acid generally to manganese, but only when the water has such a relation to the manganese that the manganese will be immersed in the water employed, and the vapours introduced below the water, by which arrangement the chlorine, as it is produced, will pass up through the water in the vessel containing it, and go off by a pipe. *n*, is a vessel which is lined with fire-brick or earthenware tiles, suitable for resisting, as much as possible, the action of the acid. The pipe, *m*, is connected with an earthenware pipe, *o*, which, at the lower part, is connected to a hollow ring, *p*, with several small holes around the inner surface at *q*, *q*. By this means the vapour of muriatic acid is conducted below the water and the manganese. The manganese is agitated from time to time by a suitable agitator, *z*, which is shown to be of iron covered with lead, working through a stuffing-box, *r*, or the agitator may be of strong earthenware, affixed to an iron axis, there being a tube covering the shaft of the agitator, as is shown, the object of which is to protect the stuffing-box, and in case of leakage of the stuffing-box only a very small quantity of chlorine would escape. *s*, is an outlet for removing the materials remaining in the vessel, *n*, when the process

is complete. *t*, is a manhole for charging the vessel with ground manganese and water, and *v*, is a tube by which the chlorine is conveyed away from the vessel, *n*, into the vessel, *u*, which is lined with tiles of fire-clay or earthenware, where it is washed by passing through water and from the vessel, *u*, into a similar vessel again to be washed, there being a small quantity of manganese (10lbs. in each of the vessels, *u*), when the chlorine may be conducted off, and may be used for making chlorides or otherwise, as is well understood. In charging the vessel, *n*, I throw in seven cwt. of manganese (of sixty-two per cent.), and eleven to twelve cwts. of water (which is a proportionate quantity for the charge of the decomposing vessel or retort, *a*, *a*), and then close the manhole. These charges will be worked off in about fifteen hours or less, and care should be observed to keep the process during that time as equal as possible. *w*, is a plug in the vessel, *u*, for drawing off the water by a syphon from the vessel, *u*, after the process has been complete, which water is used on next charging the vessel, *n*. The workman can also ascertain at the plug-hole, towards the end of the process, whether chlorine is coming over, if not, he should stir with the agitator in order to cause the manganese to float in the water, and when chlorine ceases to come over, the process is complete, and the workman, after a little practice, with care will judge, by listening at the pipe or tube, *v*, whether the process is going on regularly. If he finds, by the quick bubbling of the vapours in the vessel, *u*, that the materials in the vessel, *n*, are boiling too freely he will cease stirring, and if that does not retard the action sufficiently then he should damp the fire. The charges being worked off, the fire is to be put out, and the sulphate of soda drawn from the vessel or retort, *a*, *a*, having first opened the valve of the pipe into the chimney. The sulphate of soda thus obtained is drawn or run into and finished in an ordinary reverberatory furnace, adding and mixing therewith nine

to ten cwt. of common salt. The matters from the vessel, *n*, are to be drawn, and a fresh charge of manganese and water is then to be introduced into the vessel, *n*, and a fresh charge of common salt and sulphuric acid. The fire is then lighted, and the heat of the bath in the vessel, *j*, *j*, gradually raised to 300 degrees of Fahrenheit, and then, towards the completion of the process, to 320 degrees to 330 degrees of Fahrenheit, the processes will then go on as above described, the stirring of the manganese in the vessel, *n*, requiring to be more constant as the process draws to an end. Before drawing out the materials from the vessel, *n*, I throw in three to four pails of milk of lime, and stir up the contents of the vessel, *n*, and then in about ten minutes the contents may be drawn without injury to the workman.

Having thus described the nature of my invention and the manner of performing the same, I would have it understood that I do not confine myself to the details shown and explained, provided the peculiar character of either part of my invention be retained, and although I prefer to use the two processes conducted according to my invention, combined as above shown and described, they are capable of being used separate from each other, and chlorine may be made according to my invention, by causing the vapours or gas of muriatic acid to pass with sufficient pressure into a vessel containing manganese, according to my invention, and the acid vapours from the vessel, *a*, *a*, may be condensed or otherwise, as heretofore practised. But what I claim is,

First, the mode of manufacturing sulphate of soda by decomposing common salt by sulphuric acid, in close vessels or retorts made of or lined with lead, and heated externally, as above described.

Secondly, I claim the mode of manufacturing chlorine by means of the vapours or gas of muriatic acid introduced below water in which manganese is immersed, as above described. And,

Thirdly, I claim the stirring or agitating of manganese with water when being acted on by vapours or gas of muriatic acid in the manufacture of chlorine.—In witness whereof, &c.

JULIUS SEYBEL.

Enrolled September 30, 1842.

Specification of the Patent granted to HENRY BARRON RODWAY, *of Birmingham, in the County of Warwick, Wine Merchant, for Improvements in the Manufacture of Horse-shoes.*—Sealed March 7, 1842.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention relates to constructing horse-shoes by employing bar-iron rolled with a groove therein, equal at least to three-eighths of an inch wide, and produced by rolling in bars of iron not less than three-quarters of an inch wide.

In making horse-shoes as heretofore practised, there has been usually a small groove towards the outer edge of each horse-shoe where the holes are punched for receiving the nails, and this groove has in some cases to proceed all round, particularly in what are called racing-plates. In such cases the groove has been about wide enough to receive the heads of the nails by which the horse-shoes are affixed. I do not, therefore, claim the making horse-shoes with grooves generally, but only when such grooves are at least three-eighths of an inch wide, and made by rolling in a bar of iron at least three-quarters of an inch wide, and in order that the invention may be fully understood and readily carried into effect, I will proceed to explain the means pursued by me.

Description of the Drawing.

Fig. 1, represents plans of parts of bars of iron suitably

formed for making horse-shoes of various sizes, according to my invention, and I form such bars by means of suitable rollers in the same manner as other bar-iron is rolled, the rollers employed differing only in the grooves formed therein; as will be understood, by the sections of the bars used.

Fig. 2, shows cross sections of the bars used, and suitable for different sizes of horse-shoes, by which the nature of the groove or concavity formed on the under surfaces will readily be seen, and it will also be seen that the part or edge of the bar which is to form the inner rim or edge, *c, c,* of a horse-shoe is rolled of less height or thickness than the other edge, *b, b,* which is important to the obtaining a well-formed horse-shoe, according to my invention. It will readily be understood that the sizes and weights of the shoes will, as heretofore, vary according to circumstances.

Fig. 3, shows the plan or underside view of a horse-shoe made according to my invention. And,

Fig. 4, shows a cross section of the shoe taken at the dotted lines, *a, a,* in figure 3. The outer edge, *b, b,* of the horse-shoe it will be seen is about twice as wide as the inner edge, *c, c,* of the horse-shoe, the space between the edges or rims, *b,* and *c,* being a concave groove, *e,* the holes for the nails being punched through the horse-shoe from within the concavity or groove, *e,* as is shown at *d, d, d,* and near to the outer rim or edge, *b, b,* and the holes are sunk or enlarged sufficiently to receive the heads of the nails, as is shown, or, if desired, the nails may be passed through holes formed in the rim or edge, *b, b.* The drawing shows the concavities or grooves, *e,* between the rims or edges, *b,* and *c,* formed at the underside of the horse-shoe to be equal to about two-thirds the width of the horse-shoe, which is the width of groove I prefer in all cases, and such is the depth of the groove or concavity that the pressure of the foot will be principally sustained by the outer and inner rims or edges, *b,*

and *c*, whereby the horse will be enabled to take more firm and secure hold upon the ground, and the accidents and diseases occasioned by slipping and other evils, arising from the construction of horse-shoes in relation to the formation of horses' feet, will be less frequent. It will be evident that a horse-shoe of a given weight and dimensions will, when made according to my invention, be more stiff than one of the old construction. I would remark, that the smith in making up shoes from bars of grooved iron, according to my invention, may "steel" the front parts thereof, and may, when desired, form "calkings;" and, further, he may make the heels solid by beating up the ends and forging the same, or in cases where it is desired to have the heels solid, the bars of iron may be rolled with hollow grooves, with intervals of solid between them, so that when cut into lengths for horse-shoes the solid parts will form the heels of the horse-shoes.

Having thus described the nature of my invention and the manner of performing the same, I would wish it to be understood, that I do not confine myself to the precise details here given, nor do I confine myself to the sizes shown in the drawing, provided they be as large or larger than the least dimensions stated in this my specification. And I would remark, that I have not thought it necessary to describe the process of shaping or forging shoes made according to my invention, as a shoeing-smith will readily perform that operation, and it will be found that horse-shoes made from grooved bars, such as are above described, will require much less time and labour in making them than when forging the same sized horse-shoes from a plain bar of iron. What I claim is, the mode of manufacturing horse-shoes by making and employing bar-iron rolled with a groove therein at least three-eighths of an inch wide, and in a bar at least three-quarters of an inch wide, as above described.—In witness whereof, &c.

HENRY BARRON RODWAY.

Enrolled September 7, 1842.

Specification of the Patent granted to WILLIAM BROCKEDON, *of Queen-square, in the County of Middlesex, Gentleman, for Improvements in Manufacturing Fibrous Materials for the Cores of Stoppers to be coated with India-rubber, and used for stopping Bottles and other Vessels.*—Sealed March 21, 1842.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—This invention relates to improvements in the manufacture of stoppers to be coated with India-rubber, to be used as substitutes for corks and bungs for stopping vessels, and consists in the mode of preparing the fibrous core of which the stoppers are made. I would, in the first place, state, that my practice heretofore has been to make stoppers of wool and other fibrous substances, by laying a number of coarse threads together in a straight line; these are tied or fixed at one end, and twisted at the other, until they form a cylinder, which is put into the fulling mill and beaten until the materials are felted into a cylindrical rope sufficiently firm for the purpose of retaining its form, and proper for holding the cork-screw. When such rope or substance is dried, it has been covered with sheet India-rubber, the surface being first coated with a solution of India-rubber to make the sheet-rubber adhere; or the surface has been covered by placing the core in a solution of India-rubber repeatedly, until the coating was of a sufficient thickness as was described in the specification of my former patent. The coated substance has then been cut into the lengths required for stoppers, and the ends of the stoppers were covered by the same process, either with a solution of India-rubber or with sheet-rubber. Now, the present invention consists of a mode of preparing the cores from fibrous materials for such descriptions of stoppers which I will now describe. I take a sufficient number or quantity of

threads, rovings, or slivers of cotton or wool, or other fibrous substances, to form the core of the size required, and instead of bundling and felting them as heretofore, I draw them through a frame having two or more holes therein, each hole receiving its proportionate quantity for the rope to be made, and as the strands or collections of fibres pass through the holes, they are lapped or bound together with a thread strong enough to bear the strain of the corkscrew when withdrawing a stopper from a vessel. The separate strands having been thus separately lapped with thread, are then brought together and drawn through another hole of the size required for the cores of stoppers. The quantity of fibrous material or threads thus drawn through and lapped with strong thread, and the size of holes required, will depend upon the degree of hardness and diameter required for the stoppers, as these two are more lapped; strands pass together through the hole which is to determine the size of the core. They are to be combined by tightly lapping or binding together with a thread, in order to keep the strands collectively in the cylindrical form required. The rope or substance thus produced is now in a fit state to be covered with India-rubber in sheet or in solution, which is done as heretofore.

Description of the Drawing.

a, is the driving pulley keyed on the outer tube, *d*, such tube turning freely in the bearing, *c*. *b*, is a loose pulley. *c*, the fixture or bearing for carrying the tube, *d*. The spur-wheel, *h*, is keyed on the outer tube, *d*, and takes into and drives the cog-wheel, *i*, affixed on the shaft, *t*, and the shaft, *t*, by the cog-wheel, *u*, affixed thereon, gives motion to the cog-wheel, *v*, and the cog-wheel, *v*, gives motion to the cog-wheels, *s*, *s*. The shaft, *n*, is driven by the spur-wheels, *j*, *k*, *l*, and *m*, in the following manner:—The wheel, *j*, is affixed on the shaft, *t*, and drives the cog-wheel, *k*, to which a pinion, *l*, is

affixed, which takes into and drives the cog-wheel, *m*, affixed to the shaft, *n*, and the shaft, *n*, drives the drum, *r*, through the worm and wheel, *o* and *p*. The inner tube, *e*, does not revolve; it may be removed and replaced by another of a larger or smaller size, according to the size of core required. The nozzle, *g*, which is screwed into and revolves with the tube, *d*, may also be removed and replaced by another, if another size core be required, and the inner tube, *e*, is retained from revolving by the frame or bearing, *f*. The bobbin, *y*, containing the lapping thread, runs loose on a pin or stud fixed on the pulley, *a*, and one end of the lapping thread is passed through a hole in the tube, *d*, and nozzle, *g*; and in like manner the two or more bobbins carried by the wheels, *s*, *s*, lap each of the strands with a thread, each of the inner tubes, *o*, which governs the size of the strands, being kept from revolving. Thus it will be seen that each strand or collection of fibres is bound separately in coming through its hole or tube, *o*, *o*, and the strands are collected together by the tube, *e*, and they are bound into one rope or substance as they pass away from that tube, *e*, and the rope or substance thus formed is drawn through the tube, *x*, and is affixed to the drum, *r*, and is wound thereon till the drum becomes charged with as many turns as it will contain, when all is removed except the length necessary for fastening and continuing the process.

Having thus described the nature of my invention, and the manner of performing the same, I would have it understood that I do not claim under the present patent the manufacture of fibrous stoppers covered with India-rubber generally, that being now a well-known manufacture under my former patent, nor do I confine myself to the precise details herein described, so long as the peculiar character of my invention be retained; and although I have shown and described the cores as being composed of only two strands, three or more may be used by varying the parts and adding suitable tubes and parts for that

purpose. But what I claim is, the mode of preparing the fibrous cores of stoppers to be covered with India-rubber, by drawing the several strands or collections of threads, rovings, or slivers, of which they are composed, through a series of holes, and binding the strands separately, and combining the strands by binding them together as herein described, whereby a proportion of the binding threads used for the lapping of the separate strands shall be exposed to the outer surface of the core, and shall become firmly attached to the coating of India-rubber, whilst other parts of the binding threads being compressed within the core, become a means of entanglement for the corkscrew when driven into a stopper so constructed.—In witness whereof, &c.

WILLIAM BROCKEDON.

Enrolled September 21, 1842.

Specification of the Patent granted to BENJAMIN GILLOTT, *of Great Saffron-hill, in the County of Middlesex, Cutler, for Improvements in Heating and Ventilating.* —Sealed February 26, 1842.

To all to whom these presents shall come, &c., &c.—The heating and ventilating apparatus is made, as far as regards the fire-place, the same as an ordinary hot-air stove, over which is placed a boiler, which may be made of copper, iron, or any other suitable metal, or earthenware or glass, containing vertical tubes, which are surrounded by water; the tubes may be made of any shape or size, and placed in any position. Over the boiler is placed a cover or lid with a small opening at the top for the supply of water. A fan or blower is placed so that the neck of the box which contains it terminates against or opposite the open spaces caused by the tubes in the boiler, and is set in motion by a wheel turned by a crank handle, over which is passed a strap attached to a pulley

fixed on the spindle, to which the fan or blower is fastened. The air is thus thrown, driven, or drawn through the open spaces, and gets hot in its passage to the opposite side of the boiler, where a pipe may be placed to receive and convey it to any place or distance required. The air thus heated by passing through boiling water, is more particularly intended for respiration, though applicable to all purposes requiring heat of moderate temperature perfectly pure. When the apparatus is made for commercial purposes, where heat only is required independent of its quality, no water is used, but a cockle or number of metal tubes instead of a boiler, thereby allowing greater heat to be obtained, though not of equal purity, but still very little deteriorated in consequence of the rapidity with which it is forced or drawn through the apparatus by the fans or blowers; or the fire-place may be constructed under the fan or blower box, by making the said box double, and having an opening at the bottom for the entrance of the fire, between the two cases, which will also form the flue for carrying off the smoke. A boiler or cockle may be placed in the neck of the box, to preserve and regulate the heat, or the box itself may be used as the boiler, if preferred. The fans or blowers are constructed in the usual manner, similar to those used in foundries, viz.:—A number of pieces of wood, iron, or any other suitable material of equal size, is fastened on a spindle, and placed in a box open at the sides or any other part most convenient, and caused to revolve by a wheel, pulley, or any and every other power or means, as steam, horse, wind or draft, or manual labour, &c. &c. &c. The fans or blowers may be placed in any position, vertical, horizontal, or oblique, as may be found most desirable or convenient. They may also be placed at either side, at the top or bottom of the apparatus, or at any distance from it found most useful or convenient for room, &c. They may be also placed so as to draw the air through the apparatus with the same effect as forcing

it through. The pipes for conveying the heated air to or from the apparatus, may be constructed of any metal, earthenware, glass, wood, or any other suitable material. The fire-place is composed of iron and fire brick, or fire clay, and the frame, sides, &c., of the apparatus is made of iron or any other metal, or stout earthenware. The wheel and pulley may be of iron, wood, brass, or any other material. The fan or blower box may be made of wood, iron, brass, copper, zinc, or any other suitable material. When the apparatus is intended as a permanent erection, a great part of it can be constructed of brickwork, and the cockle or fire-place built in, similar to the setting of an ordinary copper, and the fans or blowers added thereto in any manner found most desirable or convenient.

Having thus described the nature of my invention, and the manner of performing the same, I would have it understood, that I do not claim any of the separate parts, nor do I confine myself to the precise details herein shown, so long as the character of the invention be retained. But what I claim is, the mode of heating and ventilating apartments, buildings, and places, by forcing air through a heating medium, and thence into the place to be heated and ventilated, by means of a fan or blower, as herein.—In witness whereof, &c.

BENJAMIN GILLOTT.

Enrolled August 26, 1842.

Specification of the Patent granted to WILLIAM BAKER, *of Grosvenor-street, Grosvenor-square, in the County of Middlesex, Surgeon, for Improvements in the Manufacture of Boots and Shoes.*—Sealed January 27, 1842.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—The nature of my said invention consists in a mode of

constructing the soles of boots and shoes, by introducing a layer of horse or other strong curled hair (felted or matted together), with or without a layer of caoutchouc between the inner and outer soles of shoes and boots, by means of which the damp and cold of the under surface of the outer sole leather of a shoe or boot will not so readily pass to the foot of the wearer of such boot or shoe, and in addition thereto a sole so made will offer a more elastic substance for the tread of the foot; and in order that the invention may be more fully understood, and in further compliance with the said proviso, I, the said William Baker, do hereby describe the manner in which my said invention is to be performed, by the following statement thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon (that is to say) :—

Description of the Drawing.

Fig. 1, is a side view of a boot partly in section, showing the layer of felted or matted horse or other strong curled coarse hair placed between the inner and outer sole, and occupying the place of the small strips of leather or other material commonly used by shoemakers, and sometimes called bottom fillings, and also of the shank pieces, both of which are here unnecessary.

Fig. 2, is a plan view of the layer of hair. The dotted lines represent the outer edge of the sole, which is larger than the layer of hair, to allow of the edges of the sole being finished as in the common boot.

Fig. 3, is a partial section of a similar boot to figure 1, the only difference being the addition of a layer of caoutchouc (India-rubber) under the layer of hair, to prevent the water from further penetrating the sole. *a,* is the felted or matted hair, *b,* the caoutchouc, and *c,* the under sole of the boot.

I would remark, that when the sole of a boot or shoe is to be composed of more than two thicknesses of leather,

then I prefer that the layer of felted or matted hair should be between the two upper pieces of leather of which the sole is composed. In some cases, in addition to the use of a layer of matted or felted hair, I apply a thin sheet of India-rubber (caoutchouc) on the under surface of the matted hair, either by applying the solution of India-rubber (sometimes called India-rubber cement, which is well known, and can readily be purchased), thereto, or by placing a thin sheet of India-rubber on the under surface of the matted or felted hair, when it is introduced between the soles in manufacturing a boot or shoe.

Having thus described the nature of my said invention and the manner in which the same is to be performed, I would have it understood, that what I claim as my invention is,

First, applying a piece or sole of matted or felted horse or other strong curled hair between the inner and outer sole in the manufacture of a shoe or boot, as before described. And,

Secondly, combining the use of India-rubber and matted or felted hair, as before described, between the inner and outer sole of a boot or shoe, as before described, in the manufacture of the same.—In witness whereof, &c.

William Baker.

Enrolled July 27, 1842.

LAW REPORTS OF PATENT CASES.

Common Pleas, Westminster Hall.

Before Lord Chief Justice Tindal *and a* Special Jury.

February 11, 1840.

Crane *v.* Price *and* Others.

(Mr. Carpmael's examination—continued from page 244.)

Mr. Smith.—I believe the air is heated by contact with the heating surface, as you have described?

Witness.—The direction of this specification is simply this:—Make a vessel of the required dimensions, and at one end have an opening for a pipe, through which you blow the air. At the other end you may have a pipe which connects with the twire, which conducts the air into the furnace, and therefore it blows through and through.

Mr. Smith.—Without any breaks at all?

Witness.—No breaks or anything of that kind; no necessary contact in the current of air passing through a large vessel, only parts of that would be in actual contact.

Mr. Smith.—Will the quantity of heat the air obtains diminish according to the increased size of that vessel?

Witness.—Clearly so. It might be illustrated in this manner:—If a blast of air was passing through this court, and the walls were heated; or if a room was equally heated to one of one-tenth the size, or something of the kind, it would be nearer an approach to the external heated surface then, the larger the vessel grows.

Mr. Smith.—In the latter case the air would be raised much higher in temperature than the air in this court?

Witness.—Yes.

Mr. Smith.—Then by following these directions and increasing the size of the vessel, you would diminish the temperature of the air?

Witness.—Clearly so; and there are no other directions that would lead you to depart from that rule.

Mr. Smith.—What degree of temperature, in your judgment, could be obtained by following those directions?

Witness.—It would be difficult to say what temperature; but I should say, as you increase in size you might blow through without altering the temperature of it, if you increased in very large proportions.

Mr. Smith.—Now, I will take a receiving vessel, such as would be used in the furnace in ordinary use for the manufacture of iron?

Witness.—Then, if you follow this rule, and made the

vessel in capacity equal to the large blast of a smelting furnace of the iron-works, I should say you would never get 200 degrees, or anything like that, because the vessel would be so very large.

Mr. Smith.—Are you aware, Mr. Carpmael, practically from your own knowledge, whether receiving vessels of the hot air apparatus put up after Mr. Neilson's patent, followed the directions there given, and were in that shape?

Witness.—My information generally goes that he followed the making of large vessels similar to what he describes in his specification.

The Lord Chief Justice.—Neilson did?

Witness.—Yes, my Lord.

Mr. Sergeant Bompas.—I think you said to your own knowledge?

Witness.—My information.

Mr. Smith.—Have you ever seen any, Mr. Carpmael?

Witness.—I have never seen one of Mr. Neilson's so applied. I do not think there is one existing in that way.

Mr. Smith.—You have never seen one, and you do not believe there is one existing?

Witness.—Yes.

The Lord Chief Justice.—That is, not exactly according to the specification?

Witness.—Not following it, my Lord.

Mr. Smith.—What is the plan you have seen adopted of late years as a hot-air apparatus?

Witness.—All tubes in various shapes and forms.

Mr. Smith.—For how many years have you seen those tubes in practice?

Witness.—I do not know. I have been at iron-works during the whole time that hot-air blast has been used. I do not know how long I have known tubes; but I have known of Neilson's patent ever since it existed.

Mr. Smith.—Have you seen tubes used as that model of Mr. Crane's?

Witness.—I have seen them at Mr. Crane's.

Mr. Smith.—Now, in your judgment, are those tubes the same mode as that pointed out in Neilson's patent?

Witness.—Distinctly not; they involve quite new principles.

Mr. Smith.—I believe you drew Mr. Crane's specification?

Witness.—I did.

Mr. Smith.—Were you aware of the modes of applying hot air by tubes which you have spoken of, at that time?

Witness.—It was the only mode I knew to be in practice.

Mr. Smith.—I believe, Mr. Carpmael, you have been from time to time consulted about the use of anthracite or stone coal?

Witness.—I have been for several years consulted most extensively, both from America and from England—America in particular.

Mr. Smith.—Have you known of attempts having been made to use that coal?

Witness.—Yes; I have heard many modes suggested of burning it.

Mr. Smith.—Were you aware of any mode of burning stone coal combined with a hot air blast before Mr. Crane's discovery?

Witness.—Never.

Cross-examined by Mr. Sergeant Bompas.—I have advised all my life on buildings and structures, and as to machinery of every class and kind. I have superintended works and erected works. The first I superintended was Marlow Bridge, under Mr. Millington. I made drawings for the bridge, and superintended the works occasionally. Mr. Clarke subsequently finished the bridge in consequence of Mr. Millington going to America. I was engineer to some salt works in Cheshire, that cost from 180,000*l.* to 200,000*l.* I directed a large portion of the finishing of the works, both as to the canal and the buildings. I am chiefly engaged in patent business, but

I am very largely engaged in advising on machinery of various constructions, independent of patents. I have read Botfield's specification. He broadly claims the use of heated air in blast furnaces. He says, "I claim as my patent the use of the additional chimney or chimneys, and the application of rarified air, gas, flame, or heated air, to, at, or near the twire or twires of the blast furnace."

George Cottam sworn—Examined by Sir F. Pollock.— I am an engineer and general iron founder, and have been connected with the iron trade for the last thirty years. I have never heard, prior to Mr. Crane's patent, of iron being made by the use of anthracite and hot blast. I think it a very useful invention. In 1837, I heard a paper read at the British Association on the subject of Mr. Crane's invention, and I immediately ordered ten tons of it to try experiments. I try experiments on all new iron. I cast a bar or two of it, and I found it very strong. The average weight at which ordinary iron four feet long and one inch square breaks, is 440 to 445 lbs., but Mr. Crane's iron of the same dimensions broke at 599 lbs. These experiments were made in 1838, and not at all with reference to this trial. On account of the great strength of this iron, it will be found of great advantage in constructing large buildings, as the same strength may be obtained with a saving of 25 per cent. in the weight.

Sir F. Pollock.—That is my case, my Lord.

The Solicitor-General.—May it please your Lordship,— Gentlemen of the Jury, I am afraid when the moment arrives at which you will have to deliberate upon your verdict, you will be of opinion that the whole merits of this case might have been laid before you in a much shorter time than has been occupied. I cannot help thinking that a great many matters have been introduced in the course of the evidence which have nothing on earth to do with the point upon which alone your judgment is

to pass; and having attended to the course of the statement on the part of my Learned Friend, I was a little at a loss to know how, in the result, my Learned Friend meant to prove many of the facts he has taken great pains to prove. Therefore it has been in the uncertainty of the colour which in one course of the case might be given to it, we have found it necessary to travel to a certain extent into many facts which, as the case is now left, appear to me to be totally immaterial.

Gentlemen, every cause of this description is of importance. It is of great importance that due encouragement should be given to talent, and to genius, and to industry, and, where it takes place, expenditure of capital, in the endeavour to discover and produce useful inventions. We are all interested that fair protection should be given to objects of that nature. But that is not the only point that is of importance in a patent cause. Not only are the persons who spend their time and talent (and their money frequently) in endeavouring to bring before the public useful inventions; but there are others who are exceedingly anxious to intercept the fair course of trade and commerce, who seek to appropriate to themselves matters in which they have no just right or interest whatever; who seek to appropriate for their individual purposes that in which, if there be any merit in the way of genius, belongs to others, and which the whole public have just as much right to use as themselves. And the important duty which a jury has to perform in a case of this description is, to watch and to ascertain the real character of the case, not to allow any of those speculators who are watching anxiously to get beforehand with their neighbours, and with others engaged in the same trade, to appropriate to themselves a vast deal of merit of which not a shadow belongs to them; who seek to confine to their own advantages a trade which ought to be free.

My Learned Friend seemed to me to desire to carry the cause by the force of the eulogy of his client. I scarcely

ever heard so much said of any patriot who had come under my notice, of any great and distinguished character, who had benefited his country half so much as Mr. Crane. Indeed, the encomiums bestowed upon him, and the importance of the part he has acted, I only recollect to be equalled in a very celebrated work with which we have all been lately entertained. I do remember that in the Muffin and Crumpet punctual and early Delivery Company, in "Pickwick," there is an eulogy on that Company nearly equal to that which my Learned Friend has bestowed on Mr. Crane; but with that exception I do not recollect ever to have heard so much praise bestowed upon an individual as I have heard from my Learned Friend.

Gentlemen, it is of extreme importance, that you should be very early called to what is the real point of this case, and of Mr. Crane's merits. You will long ago have observed that Mr. Crane has no merit whatever in bringing before the public notice the hot blast. The hot blast was an invention of which Mr. Crane only heard in common with the rest of the public. The endeavour to appropriate stone coal as an article of fuel in the manufacture of iron, that is an idea which Mr. Crane has no pretence to the merit of having originated; individual after individual had perceived what would be the advantage of using stone coal as an article of fuel in the smelting of iron, and for a variety of other purposes, long before Mr. Crane had any dreamings on the subject. That hot blast is an invention which has been brought before the public, not to be limited in its application to this or that particular purpose, not to be limited to furnaces used merely for the making of iron, but applicable to all purposes, all furnaces, all ovens, all apparatus in which great heat is to be applied to articles requiring it for the purpose of their manufacture. Mr. Neilson's patent is not a patent for the manufacture of a particular article by the application of the hot blast. He brings

forward to the public the manner in which the hot blast may be erected, and suggests the great use that may arise from the application of that hot blast to furnaces, ovens, and other things. It is essential, therefore, to be borne in mind, that Mr. Neilson has a right to apply his hot blast to all the purposes to which it can be made applicable. He understood too well the merit of his own invention; he was too well apprised of the great extent of its application to state in his specification that it was to be applied only to this or that purpose or manufacture. His statement is, that it is to be applied to the heating of ovens and furnaces, and various other descriptions of works, to which he refers; he has supposed, and justly supposed, that wherever the application of that hot blast can be found to be useful, whether for one purpose or another, as he had the cost, and the labour, and the merit of the invention, he was entitled to participate in the profits. But if I apprehend this case, his patent is not worth a farthing; everybody may have the profit of it but him. One man will find out that it is good to heat an oven for a certain purpose, and that it will operate upon a certain class of fuel. We hear of a thousand descriptions of cases applicable, no doubt, to different purposes. One man will find out that for the making of china, or some other purpose, one description of coal is extremely material to be used; another will find out that a different description of coal is important for another branch of manufacture; and the thousand classes may have, for ought I know, a thousand different applications. But if every gentleman who finds out that the hot blast is good to operate on that coal, may take out a patent for it, what is the use of Mr. Neilson's patent to him? The question here is, what appears to me the absurd pretence, the unfounded pretence, that because Mr. Neilson's patent has been found applicable and useful in its application to stone coal, the individual who can first get a patent for that, has a right to exclude all the

world, and Mr. Neilson, I suppose, among the rest, from the application of the hot blast to stone coal. Why stone coal any more than any other coal that may be applicable to any other manufacture? Why one description of furnace more than another? Pray what is there in Mr. Neilson's patent that is to prevent him, if he thinks fit, applying his hot blast to stone coal or anything else? Is his patent only that he may apply it to certain fuel, or to a certain description of coal, or a particular description of furnace? By no means; he has a right to apply the hot blast to every description of fuel on which it will operate. And Mr. Crane—the folks engaged in the iron trade having been trying to work stone coal with cold blast at a certain time—when Mr. Crane, in common with others, formed a guess of what it would do, he runs and gets a patent, gets his Counsel to pronounce the eulogy you have heard, and which is to exclude the rest of the world from the application of this hot-air blast to stone coal; and all the merit of the greater strength of iron, all the merit of the economy, is, forsooth, not to be applied to poor Mr. Neilson, who invented the hot blast, which is the sole cause of all this, but to Mr. Crane; he is the benefactor to the country that is to extend its commerce so much. And what has Mr. Crane done? He found that attempts were making to manufacture iron from stone coal; he found there was such a thing as the hot blast. People had endeavoured to manufacture iron from stone coal by the cold blast, upon which Mr. Crane says, "Oh! I will take the hot blast, and I will apply it;" and iron is made now as before, not the slightest alteration in the materials, not the addition or subtraction of a material, no alteration in the course of the manufacture. There is the furnace as it was before; it had not the benefit of Mr. Crane's genius bestowed upon it, and nothing but the application of Mr. Neilson's patent to it; and there is the iron. That is the whole; no new discovery as to the mode of making iron; no

alteration in the course of manufacture, nor in the leas degree any alteration in the application of the materials, or the materials themselves, nothing on earth; but the question simply being whether Mr. Neilson's patent may be applied to a mode of making iron perfectly well known before, and which only failed to make good iron for want of Mr. Neilson's patent.

(To be continued.)

Vice-Chancellor of England's Court,—Oct. 27, 1842.

ELLIOTT *v.* FRIEDEBERG.

Mr. James, on behalf of Mr. Elliott, a button-maker residing in Birmingham, applied to restrain the defendant, who carried on business at Hull, from infringing a patent obtained by the plaintiff in 1837, the validity of which had been fully established in 1840, by a trial at law in the Court of Common Pleas, upon which occasion the usual issues were taken of "Not guilty," "that the plaintiff was not the first and true inventor," and so forth, upon all of which issues a verdict was entered for the plaintiff, the effect of which verdict had been to cause all the other persons who were infringing to submit entirely to the plaintiff's right, and pay him license dues. In the present case Julius Friedeberg had lately been very largely importing into this country buttons made upon the principle of Mr. Elliott's patent. The affidavits stated, that plaintiff having heard of the infringement, a person was sent down to Hull to obtain legal evidence thereof; that he there purchased three gross of the said buttons (specimens of which were produced to his Honour), from the defendant. The patent was for making buttons with a centre pattern, by dies and pressure. The present application was to restrain the defendant from importing into this country, as well as selling and vending, buttons made upon the plaintiff's principle.

The Vice-Chancellor thought the infringement had been clearly proved, and granted the injunction in the terms prayed, at the same time expressing an opinion that it was a very clear case.

SCIENTIFIC MISCELLANEA.

Progress of Foreign Science.

Report of the Commission of the Academy of Sciences upon the Memoir of M. Ebelmen, on his Researches on the Composition and Employment (for manufacturing purposes) of the Gases evolved from Blast Furnaces.

(Continued from page 252.)

M. Ebelmen arrives at a very remarkable conclusion, viz., that the combustible gases which issue from the mouth of the blast furnace, contain an amount of fuel, which in the case of Clerval represents sixty-two per cent., and in that of Audincourt sixty-seven per cent., of the whole fuel employed, so that the useful effect of the fuel consumed *in* the blast furnace at Audincourt is only one-third of its actual value. This result is rather below than above the truth, because the furnace at Audincourt is upon a good model, because M. Ebelmen, in his calculations, has assumed, at zero, the initial temperature of the ascending column of air entering the furnace and that of the inflammable gases, and has taken no account of the combustible materials disengaged from the wood, which are condensible by sulphuric acid, from which it is evident, that cast-iron being fusible at 1200 degrees, the temperature produced by the combustion of the gases of

the blast furnace will be sufficient for its refining and working subsequently.

But the question arises, can we collect the gases of blast furnaces? To take them from the lower part of the belly of the furnace would expose the combustion in the fire to derangement, and to take them near the mouth is to lose a portion of their useful effects.

M. Ebelmen thinks that it will be preferable to collect them at this latter spot, but that then we must introduce the ore to the furnace previously calcined, at 300 degrees. In adopting this process, we can still augment the good effect, by mixing the finely divided ore with sawdust or powdered charcoal and moulding it into bricks, and then roasting, as one of the reporters (M. Berthier) long ago advised. M. Ebelmen, having conducted his research so far, asks, "Will it not be advantageous in many metallurgic processes, to burn the fuel in the state of gas rather than in the solid form?" Thus the limit of temperature which we can attain in draft furnaces is by burning charcoal with air in excess, at 0° = 2232°, and if the air is at 300° = 2518°. But this temperature is limited to a small space on account of the rapidity with which the carbonic acid produced in the first instant is reconverted into carbonic oxide the instant following, so that when we burn charcoal on the grate of a reverberatory furnace by means of a blast (d'air forcé), if the bed of fuel is thick there is but a very small space near the grate. Where the temperature is high, the carbonic acid as soon as converted into carbonic oxide produces a cooling; if, on the contrary, the bed of fuel is thin, it is very difficult to avoid an excess of air, but this excess again lowers the temperature, resulting from the formation of the carbonic acid (i.e., from perfect combustion); in fact, we see how difficult it is to avoid these extremes, and to obtain the whole useful effect of the charcoal.

Setting out from these considerations, M. Ebelmen has constructed a small furnace, by means of which the

carbonic oxide produced by the atmospheric air, which transverses a bed of charcoal sufficiently thick, has been then burnt (deprived already of all its sensible heat), in a furnace properly constructed and fed with heated air, and the temperature thus developed was sufficient to melt cast-iron.

Finally, M. Ebelmen, after having found the impossibility of burning advantageously the charcoal of a blast furnace with water, because during the reaction of these bodies too much heat becomes latent, has thought of causing a current of vapour of water to arrive immediately above the grate of the furnace before spoken of, while the current of air arrives below the grate. By the help of this contrivance he has obtained a mixture of carbonic oxide and of hydrogene, the combustion of which develops heat enough to melt cast-iron.

But the fact which this last trial reveals is the possibility of developing the heat necessary for working iron, (i.e., for puddling, refining, &c.,) by employing anthracites, dry and earthy coal of bad quality, culm, charcoal dust, turf, mould, &c., which cannot be used at all or disadvantageously by ordinary methods of combustion.

It is to be wished that M. Ebelmen should continue his researches, and it will be a fine conclusion to his first happy thought of utilizing the lost flame of blast furnaces, should success crown his efforts.

The reporters observe, that it would be desirable that M. Ebelmen should submit to further experiments the actual temperature of the different heats of blast furnaces, and conclude by a high eulogium upon the skill, perseverance, and accuracy of his researches, and finish by stating, that had not the research been the result of a commission, undertaken by the author at the command of the Director-General of Mines, &c., they should have recommended its publication in the "Recueil des Savants Etrangèrs," but this being irregûlar, they propose the approbation of the Academy to M. Ebelmen, and a request on its part to continue his researches, and the

Academy have adopted these suggestions, together with the Report.

To ourselves, liberally, profusely supplied as we are with fuel, these researches do not perhaps seem of such importance as to our neighbours, but recollecting that there never yet has been a new principle developed in the arts but ere long its application and their happy results developed themselves, it cannot be doubted but that this method of using at a distance the gases now wasted in so many of our processes, may and will become of high utility in many other of our manufactures as well as in those of iron. R. M.

NOTICE OF EXPIRED PATENTS.

(Continued from page 124.)

GRANVILLE SHARP PATTISON, of Old Burlington-street, in the city of Westminster, and county of Middlesex, Esq., for a new and improved method of applying iron in the sheathing of ships and other vessels, and of applying iron bolts, spikes, nails, pintals, braces, and other fastenings, used in the construction of ships and other vessels. Communicated by a Foreigner.—Sealed September 4, 1828.—*(For account of specification, see Repertory, Vol.* 8, *third series, p.* 397.)

JOHN SEAWARD and SAMUEL SEAWARD, of the Canal Iron Works, in the parish of All Saints, Poplar, in the county of Middlesex, Engineer, for a new and improved method or methods for propelling or moving carriages and all other vehicles on roads, and also ships, boats, and other vessels on water.—Sealed September 4, 1828.

CHARLES SANDERSON, of Park-gate Iron Works, near Rotherham, in the county of York, Iron Master, for a new method of making shear steel.—Sealed September 4, 1828. —*(For account of specification, see Repertory, Vol.* 8, *third series, p.* 732.)

Samuel Brooking, of Plymouth, in the county of Devon, a Rear-Admiral in the Royal Navy, for a new method or mode of making sails of ships and other vessels. —Sealed September 4, 1828.—*(For account of specification, see Repertory, Vol.* 8, *third series, p.* 535.)

John Robertson, of Limehouse-hole, in the parish of All Saints, Poplar, in the county of Middlesex, Rope-manufacturer, for certain improvements in the manufacture of hempen rope or cordage.—Sealed September 4, 1828. —*(For account of specification, see Repertory, Vol.* 8, *third series, p.* 404.)

PATENTS GRANTED FOR SCOTLAND,

From September 1 *to October* 20, 1842.

Eugene de Varroc, of Bryanston-street, Portman-square, in the county of Middlesex, Gentleman, for apparatus to be applied to chimneys to prevent their taking fire, and for rendering sweeping of chimneys unnecessary. —Sealed September 1, 1842.

Thomas Marsden, of Salford, in the county of Lancaster, Machine-maker, and Solomon Robinson, of the same place, Flax-dresser, for improvements in machinery for dressing or hackling flax and hemp.—Sealed September 1, 1842.

Samuel Morand, of Manchester, Merchant, for improvements in machinery or apparatus for stretching fabrics.—Sealed September 1, 1842.

William Henry Kempton, of South-street, Pentonville, in the county of Middlesex, Gentleman, for improvements in the manufacture of candles.—Sealed September 2, 1842.

John George Hughes, of No. 158, Strand, in the county of Middlesex, General Agent, for a new applica-

tion of telegraphic signals, and the mode of applying the same.—Sealed September 2, 1842.

JOSEPH WHITWORTH, of Manchester, in the county of Lancaster, Engineer, for certain improvements in machinery or apparatus for cleaning roads, and which machinery is also applicable to other similar purposes.—Sealed September 2, 1842.

JOHN THOMAS BETTS, of Smithfield-bars, in the City of London, Gentleman, being a communication from abroad, for improvements in covering and stopping the necks of bottles and other vessels.—Sealed September 8, 1842.

ISHAM BAGGS, of Wharton-street, in the county of Middlesex, Chemist, for improvements in obtaining motive power by means of carbonic acid.—Sealed September 8, 1842.

CHARLES WILLIAM FIRCHILD, of Wesley-park, in the parish of Northfield, in the county of Worcester, Farmer, for an improved propelling apparatus for marine and other purposes.—Sealed September 26, 1842.

EDWIN WARD TRENT, of Old Ford, Bow, in the county of Middlesex, Rope-maker, for an improved mode of preparing oakum and other fibrous substances, for caulking ships and other vessels.—Sealed September 29, 1842.

PETER KAGENBUSCH, of Wetten-on-the-Rhine, in Westphalia, in the kingdom of Prussia, Dyer, and now residing in the parish of Lyth, in the county of York, in England, for certain improvements in the treatment of the alum rock, or schist, and in the manufacture and application of the products derived therefrom.—Sealed September 29, 1842.

HENRY BEWLEY, of Dublin, in the county of the City of Dublin, Licentiate Apothecary and Chemist, for an improved chalybeate water.—Sealed October 4, 1842.

ALFRED JEFFREY, of Lloyd-street, Pentonville, in the county of Middlesex, Gentleman, for a new method of preparing masts, spars, and other wood, for ship-building and other purposes.—Sealed October 18, 1842.

Claude Edward Deutsche, of Fricour's Hotel, St. Martin's-lane, in the county of Middlesex, Gentleman, for improvements in combining materials to be used for cementing purposes, and for the preventing the passage of fluids, and also for forming articles from such composition of materials.—Sealed October 18, 1842.—Communicated by a foreigner residing abroad.

John Ridsdale, of Leeds, in the county of York, for improvements in preparing fibrous materials for weaving and in sizing warps.—Sealed October 20, 1842.

Samuel Carson, of York-street, Covent-garden, in the county of Middlesex, Gentleman, for improvements in purifying and preserving animal substances.—Sealed October 20, 1842.

Henry Brown, of Selkirk, Manufacturer, and Thomas Walker, of the same place, Manufacturer, for improvements on woollen carding engines.—Sealed October 20, 1842.

Alphonse de Troisbrioux, of Great Russell-street, Bloomsbury, in the county of Middlesex, Gentleman, for improvements in Lithographic and other printing-presses. —Sealed October 20, 1842.—Communication by a Foreigner residing abroad.

LIST OF NEW PATENTS.

Edward Bell, of the College of Civil Engineers, Putney, Professor of Practical Mechanics, for improvements in applying heat in the manufacture of artificial fuel, which improvements are applicable to the preparation of asphalte, and for other purposes.—Sealed September 29, 1842.—(*Six months.*)

Samuel Henson, of New City Chambers, Bishopsgate-street, Engineer, for certain improvements in locomotive apparatus, and in machinery for conveying letters, goods, and passengers from place to place through the air, part

of which improvements are applicable to locomotive and other machinery to be used on water or on land.—Sealed September 29, 1842.—(*Six months.*)

William Smith, of Grosvenor-street, Camberwell, Gentleman, for improvements in treating certain animal matters to obtain products applicable to the manufacture of candles and other purposes.—Sealed September 29, 1842.—(*Six months.*)

John Rand, of Howland-street, Fitzroy-śquare, Artist, for improvements in making and closing metallic collapsable vessels.—Sealed September 29, 1842.—(*Six months.*)

James Hyde, of Dirchinfield, Cheshire, Machine-maker, and John Hyde, of the same place, Cotton-spinner and Manufacturer, for a certain improvement or improvements in the machinery used for preparing cotton, wool, silk, flax, and similar fibrous materials for spinning.—Sealed September 29, 1842.—(*Six months.*)

John Ridsdale, of Leeds, for improvements in preparing fibrous materials for weaving and in sizing warps.—Sealed September 29, 1842.—(*Six months.*)

John Fry Wilkey, of Mount Vernon, Exeter, Commission Agent, for improvements in carriages.—Sealed September 29, 1842.—(*Six months.*)

John George Shipley, of Bruton-street, Berkeley-square, Saddler, for certain improvements in saddles.—Sealed October 6, 1842.—(*Six months.*)

John Oliver York, of Upper Coleshill-street, Eaton-square, for improvements in the manufacture of axles for railway wheels.—Sealed October 8, 1842.—(*Six months.*)

Wilton George Turner, of Gateshead, Durham, Doctor in Philosophy, for improvements in the manufacture of alum.—Sealed October 8, 1842.—(*Six months.*)

Claude Edward Deutsche, of Fricour's Hotel, St. Martin's-lane, Gentleman, for improvements in combining materials to be used for cementing purposes, and for preventing the passage of fluids, and also for forming

or constructing articles from such compositions of materials.—Sealed October 8, 1842.—(*Six months.*)

Samuel Dotchin, of Myrtle-street, Hoxton, Jeweller, for improvements in paving, or covering and constructing roads ways, and other surfaces.—Sealed October 13, 1842. —(*Six months.*)—Communicated by his son, Samuel Dotchin, jun., recently deceased.

Charles Thomas Holcombe, of Valentines, near Ilford, Essex, Esq., for an improved mode of using certain materials as fuel; also an apparatus or method for collecting the smoke or soot arising from the combustion of such fuel, which apparatus or method is applicable to collecting the smoke or soot arising from the ordinary combustion of fuel; and also the application of the products arising from the combustion of the first mentioned materials as a manure, and for other useful purposes.—Sealed October 13, 1842.—(*Six months.*)

William Edward Newton, of Chancery-lane, Patent Agent, for certain improvements in the manufacture of artificial fuel.—Sealed October 13, 1842.—(*Six months.*) —Communicated by a foreigner residing abroad.

Robert William Sievier, of Henrietta-street, Cavendish-square, Gentleman, for certain improvements in looms for weaving, and in the mode or method of producing plain or figured goods or fabrics.—Sealed October 13, 1842.—(*Six months.*)

Peter Kagenbusch, of Lyth, in the county of York, Dyer, for certain improvements in the treatment of the alum rock, or schist, and in the manufacture and application of the products derived therefrom.—Sealed October 13, 1842.—(*Six months.*)

Henry Brown, of Selkirk, Manufacturer, and Thomas Walker, of the same place, Manufacturer, for improvements in woollen carding engines.—Sealed October 13, 1842.—(*Six months.*)

Thomas Seville, of Royton, Lancaster, Cotton-spinner, for certain improvements in machinery used in

the preparing and spinning of cotton, flax, and other fibrous substances.—Sealed October 20, 1842.—(*Six months.*)

James Palmer Budd, of Ystalyfera Iron Works, Swansea, Merchant, for improvements in the manufacture of iron.—Sealed October 20, 1842.—(*Six months.*)

William Longmaid, of Plymouth, Accountant, for improvements in treating ores and other minerals, and in obtaining various products therefrom, certain parts of which improvements are applicable to the manufacture of alkali.—Sealed August 20, 1842.—(*Six months.*)

James Statham, of West-street, Saint Giles, Venetian Lock-maker, for improvements in the construction of locks for Venetian blinds used in carriages.—Sealed October 20, 1842.—(*Six months.*)

Gilbert Claude Alzard, of Tichborne-street, Gentleman, for certain improvements in bread, biscuits, macaroni, vermicelli, and pastry, and the mode of making the same.—Sealed October 22, 1842.—(*Six months.*)

George Hazeldine, of Lant-street, Borough, Coach-manufacturer, for certain improvements in omnibuses.—Sealed October 27, 1842.—(*Six months.*)

James Gardner, of Banbury, Oxon, Ironmonger, for improvements in cutting hay, straw, and other vegetable matters for the food of animals.—Sealed October 27, 1842.—(*Six months.*)

John Mullins, of Battersea, Surgeon, for improvements in making oxides of metals, in separating silver and other metals from their compounds with other metals, and in making white lead, sugar of lead, and other salts of lead, and salts of other metals.—Sealed October 27, 1842.—(*Six Months.*)

Rowland Williams, of Manchester, Fustian Shearer, for certain improvements in machinery or apparatus for raising, shearing, and finishing velvets or other piled goods by power.—Sealed October 27, 1842.—(*Six months.*)

Macintosh, Printer, Great New-street, London.

TO THE

SUBSCRIBERS AND READERS

OF THE

REPERTORY OF ARTS

And Patent Inventions.

The Proprietor of the "Repertory of Arts and Patent Inventions" being desirous to render the publication more and more useful to the public, feeling that by so doing he will materially add to the extent of the sale, has determined to increase the size of the monthly parts by adding sixteen pages, without any additional charge, and in order to mark the period of this change, he has determined to commence a new series on the first day of January next. He is the more induced to take this course, as many of the parts of all the previous series are out of print; hence persons desirous of taking this work are prevented by not being able to obtain a complete set. Persons, therefore, wishing to take the work will now have an opportunity of commencing under the most favourable circumstances.

The Proprietor takes this opportunity of calling attention to one important peculiarity of this work, which is, that the specifications published are actual copies of those enrolled, and although there are several publications which profess to give reports of patented inventions, there is none other which gives the specifications entire, the value of which has long been extensively appreciated by the public, and the courts of law prefer the printed specifications to written copies. To persons interested in patents and manufactures it is of the greatest importance that the exact wording of a specification should be before them, without which no correct knowledge can be obtained of what a patentee really claims, and persons have often been led into difficulties by depending on partial statements published of inventions secured by patent. Nothing can be more injurious than

to read the garbled statements (often unfairly given) of the specifications of patents. In drawing a specification for a patent it is absolutely necessary that the patentee should be well and accurately informed of the claims of previous patentees, in order that he may not injure his own rights; he cannot safely trust to any other statement of previous patents than the exact wording of the specifications as enrolled. The manufacturer, who is constantly progressing with the improvements of the day, cannot safely put any new process or machinery into practice unless he have first made himself acquainted with the various patents which are in force, and he can only be made fully acquainted with the various inventions relating to his particular manufacture by reading the precise words of the specifications. Cases might here be given of manufacturers who, depending on the information of the published reports, and not finding them to include the improvements which they have been desirous of putting to work, have proceeded to do so, when, after having expended large sums of money, they have received notice perhaps of an injunction or of law proceeding for infringement of some patent, the report of which did not contain a full or accurate statement of the particular patent; and other manufacturers have taken patents for improvements of their machinery or their processes, and when they have come to specify their inventions they have been for the first time informed of the extent of a previous patent, the report of which they were well acquainted with, but which in no way conveyed a full or a correct view of the claims of invention made by a previous patentee. Hence have the *verbatim* copies of specifications published by the "Repertory" long been received as of the greatest value to the inventor, the patentee, and the manufacturer.

Another important feature in the "Repertory of Arts and Patents for Inventions" has been the reports of law proceedings in patent cases, which have appeared from time to time as causes have been decided in the courts of law and equity. Nothing has tended so much to inform the public of the value of patent property as these reports—for the most part exclusively made in this work —and although the Proprietor feels it desirable to in-

crease the number of specifications published monthly, and intends to do so to the greatest possible extent, yet it is intended, in the first instance, to appropriate a large part at least of the increase of the pages to the publication of all the patent cases, commencing with the earliest period. By this means the patentee, the inventor, and the manufacturer, will become more intimately acquainted with the protection offered by law to patentees. Till within the last twenty years little confidence was placed in this department of the law, in consequence of the number of patents which had from time to time been set aside, and the still larger number where the patentees, in consequence of the erroneous manner in which their specifications had been drawn, were afraid to come before a court of law, and suffered infringements to pass with impunity. It will readily be seen that nothing will tend more to the obtaining a correct knowledge of the law of patents for inventions than the publishing of all the reports of patent cases, together with correct copies of the specifications which have been called in question. A patentee about to have a specification enrolled, possessed of such information, will see how particular specifications have been drawn; he will see the objections which have been made thereto by counsel; he will ascertain the weight of those objections by the judgments of the courts, and he will be able more correctly than at present to judge whether his specification is drawn in a manner to avoid objections of a substantive character being made thereto, and he will the better be able to judge whether his invention is fully described, and whether the claims made comprehend the whole spirit of the invention. It is not enough simply to describe the details of an invention. If such a course had been pursued in the specifications of many of the modern cases, the patentees would have been deprived of much of the value of their patents.* The manufacturer has equal interest in knowing the law as applied to particular cases, otherwise he can never judge when he is

* See the cases of Russell v. Cowley, Minter v. Wells, Jupe v. Pratt, Morgan v. Seaward, and many others; in none of which cases had the defendants followed the specification, but they were using the general principle or peculiar character of the inventions described.

safe in putting new inventions into practice. At present such reports of patent cases as have been printed, excepting the modern ones, which have appeared in this work, are diffused over very many volumes of law books, to which few inventors, patentees, or manufacturers have an opportunity of access; hence, for all practical purposes to those who are most interested, the law reports of patent cases may be considered as a sealed book. The Proprietor of this publication being aware that Mr. W. Carpmael had what is believed to be the only manuscript copy and short-hand notes of the various reports of patent cases which have taken place from the earliest periods, has prevailed on that gentleman to publish the same, together with the specifications of the patents in question; and the Proprietor has great pleasure in stating to his readers that Mr. Carpmael has undertaken to supply sufficient matter monthly for several pages, which it is proposed shall be stitched up with the monthly parts of the " Repertory," and may be bound therewith; at the same time the parts of the law reports will be paged in such manner as to be bound up as a separate work, for which purpose there will be a proper title-page and introductory preface.

The Proprietor proposes also to infuse fresh spirit in the other matters of interest for which this work has long been known, and generally the Proprietor pledges himself that no exertion shall be wanting in rendering the work more useful to the public.

Persons desirous of commencing to take in this work, have only to order it of any bookseller in town or country, and they will be regularly supplied. Patentees who wish to have their specifications published, will be so good as to favour the Editor with the enrolled copy, with the drawings, if any (of which great care will be taken), and the same will be published without any charge; and patentees may have any number of printed copies of their specifications and drawings separate, at a very small cost.

This work will be found useful as a channel for advertisements, particularly in all matters relating to patents and manufactures.

November 10, 1842.

Macintosh, Printer, 20, Great New street, London.

THE

REPERTORY

OF

PATENT INVENTIONS.

No. CVIII. NEW SERIES.—DECEMBER, 1842.

Specification of the Patent granted to John Oliver York, *of Upper Coleshill-street, Eaton-square, in the County of Middlesex, Engineer, for Improvements in Railway Axles and Wheels.*—Sealed December 21, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—

My invention relates, First, to a mode of making hollow axles for railway carriages.

Secondly, my invention relates to a mode of making wheels for railway carriages.

Thirdly, my invention relates to a mode of bending the tyre of railway wheels; and,

Fourthly, my invention relates to hardening the working surfaces of the wrought-iron tyre of railway wheels, in order to render them more durable. And in order that my invention may be most fully understood and readily carried into effect, I will proceed to describe the means pursued by me in carrying out my invention.

Description of the Drawings.

Fig. 1, represents an axle of a railway carriage con-

structed according to my invention, one end being in section.

Fig. 2, shows an end view or transverse section of two bent plates of iron, which being welded together, form a tube, *a*, *a* (see fig. 3), which represents one end of such tube, the other end being similar. On to this tube, at each end, is to be placed the two bent plates, *b*, *b*, and retained by a hoop, *c*. These bent plates, *b*, are to give strength to the necks or parts, *d*, *d*, of the axle, which are keyed into the wheels. At each end of the two bent plates, *a*, *a*, of which the axle is composed, there is a hoop, *e*, placed, as is shown at fig. 3. The parts, *a*, *b*, *c*, and *e*, being thus combined, are to be welded and forged into the figure or shape shown at fig. 1; and I perform such welding by hammering and using suitable hollow tools or swages, as is well understood by forgemen. The hoops, *c*, *e*, producing the parts, c^1, e^1, of the axle, and the additional bent plates, *b*, produce the greater substance of the axle, as is shown at *d*. And I would state that, when desired, I make the ends of the axles which turn in the bearings of cast steel.

I will now describe the second part of my invention, which relates to a mode of applying wood between the iron felloe and the tyre of railway wheels, and in such manner that the part of the wood which composes the ring being made wedge-shaped, or having inclined surfaces, they may by sliding against other inclined surfaces cause the diameter of the wood ring to be increased, and thus tighten the tyre.

Fig. 4, shows a wheel constructed according to this part of my invention.

Fig. 5, is a section.

Fig. 6, shows some of the parts on a larger scale, and in section.

Fig. 7, shows a transverse section of some of the parts on a similar scale to those in fig. 6. *f*, *f*, shows the spokes, nave, and felloe of the wheel, which may

be of cast or wrought-iron, and the construction and arrangement of spokes may be varied: this part of my invention relating only to the mode of applying wood between the felloe and tyre, and not to the construction of the iron parts of the wheels. *g*, *g*, is the railway tyre.

I would remark, that there is a groove formed in the interior of the tyre of the width of the wood ring, and a similar groove is formed in the periphery of the felloe. Within these grooves the wood ring is securely held, as is shown in the section, fig. 7. *h*, *h*, are some of the portions of the wood ring between the felloe and the tyre: and *i*, *i*, are the other portions of the ring of wood; and it will be seen that each portion of wood, *h*, and *i*, has inclined surfaces, so that when moved the ring or circle they form will be enlarged in diameter. *j*, *j*, are plates of iron let into the ends of the blocks of wood, *i*, there being female screws formed through such plates, and which screws have a right and left hand thread, so that when the screw is turned in one direction, the wedges or inclined surfaces of wood are forced to move. In the centre of the screw is a collar, *a*, which has holes in its periphery for the purpose of inserting a pin, for moving the screw, and thus to expand the wooden ring. The screw is prevented from movement when the wheel is in use, by a pin, *b*, being either screwed through the felloe or merely passed through a hole in the felloe, and held in its place by a split cotter or key, as is shown in figures 6, 7, or the parts of the wood ring of the wheel may be separated, and the ring expanded by other means. The portions of the wood ring, *h*, *h*, are secured to the felloe and to the tyre by means of the screw-bolts, as is shown. In putting the parts of this wheel together, the ring of wood is to be placed round the felloe, and then the tyre is to be placed thereon without heating the same. The parts, *i*, *i*, of the wood ring are then to be caused to move from each other by the screws or by other suitable means,

which will enlarge the diameter of the wood ring, and thus securely hold the tyre, and the screw-bolts, *k*, will retain the parts, *h*, from moving during the expanding of the wood ring.

I would remark, that in place of having the parts of the wood ring for a wheel with inclined surfaces, such as I have described above, the wood ring may have inclined surfaces formed on the inner edges, as is shown at figures 8 and 9; and the side plates, *k*, *k*, being drawn together, and having other inclined surfaces, will cause the wood ring of the wheel to expand, and thus securely hold the tyre. The wheel, figures 8 and 9, is shown to consist of two side plates, *k, k*, the nature of which is clearly shown in the drawing, such plates being combined together by means of the screws and nuts, *l*, *l*; the ring of wood, *m*, being in several pieces, and having inclined surfaces resting within the inclined groove or channel formed by the inclined surfaces at the outer circumference of each of the side plates, *k*; hence, when those plates are drawn closer together, the wood, *m*, will be caused to expand in consequence of the inclined surfaces, k^1, k^1, forcing the wood ring outwards. In all cases I prefer to have a groove in the interior of the tyre to receive the wood ring, as is shown in the figures now under description, as well as in those before described; at the same time I would remark, that such groove is not absolutely necessary. I would remark in respect to this part of my invention, that I do not confine myself to the precise form of the parts of the wood ring, so long as such parts are wedge-shaped or have inclined surfaces, which being moved in respect to other inclined surfaces, will cause the wood ring to be expanded, so as by enlarging the diameter of the wood ring to hold the tyre; for it will be evident that such means of constructing wood rings of parts may be varied, and yet retain the peculiar property of expanding the diameter of the ring, by having inclined surfaces, as explained.

I will now describe another mode of making railway wheels with wood felloes.

Fig. 10, shows a side view of a wheel constructed according to this part of my invention; and,

Fig. 11, shows a section thereof. *z*, is the wood felloe, which is made of several parts. *y*, *y*, are the spokes, which are so formed at their outer ends as to partly embrace the wood felloe, as is shown. The spokes are each affixed to the plates, *x*, *x*, by being cast into them or otherwise, and these plates, *x*, *x*, are capable of approaching each other on the axle, *w*, on which are formed screws at w^1; on these screws the nuts, *u*, are screwed up, when necessary, to tighten the tyre; and it will be evident that by such arrangement of parts, an unifoim means of adjusting all parts of the circumference of the wood or iron felloe will be obtained, and the nuts will be held from movement by means of screws and nuts, *v*, which pass through the projecting plates, u^1, of the nuts, and through one of the holes in each of the plates, *x*, *x*.

I will now describe the third part of my invention, which relates to a mode of bending railway tyre. Figures 12 and 13 show two views of a pair of rollers and their axes, suitably arranged for bending railway tyre, and for cutting the same into proper lengths. A, B, are the two rollers; the lower roller, A, having knives or cutters, *a*, a^1, to cut the tyre to the length desired. The axis of the roller, A, is driven by a steam-engine or other suitable power, the upper roller revolving simply by the surface motion of the roller, A, acting on the bar of railway tyre. C, is a presser-lever, carrying three rollers, D, D, between which and the periphery of the roller, B, the bar of railway tyre is moved, the presser-lever being kept to its place by the diagonal stay bar, E, as is shown. The bar of railway tyre when in a heated state is to be passed between the rollers, A and B, the end of the bar being placed just beyond the cutter, a^1, by which a portion of

the end of the bar will be cut off as the bar passes between the nip of the rollers, A, B. The bar of railway tyre will then be carried forward between the rollers A and B, and be bended over the roller, B, by the presser-bar, and the cutter, *a*, will cut off the other end of the railway bar, and thus will the length of bar for a wheel be guaged, and cut, and bent, and thickened at the ends for welding, at one operation; and in order to save fuel, it is desirable to convey the bar when in a heated state from the rollers by which it has been formed, to the rollers, A, B, so as to save re-heating; or, in place of using the rollers, A, B, above described, a small pair of rollers, A^1, B^1, fig. 14, may be used; in this case the bar must be cut to the proper length by other means. The presser-bar in this machine will be similar to that before described, and there will be a semicircular guage plate, F, used, over which the bar of railway tyre is moved in order to bend it. The bar of railway tyre being thus bent, is conveyed to the second bending machine, figures 15, 16, and 17. In this machine, G, is the circular ring or mould, around which the tyre is bent. This ring or mould is capable of sliding on the bed or table, H, by means of the lever, I, which moves on an axis at J, carried by the table, H. The ring or mould, G, has two straight edges, G^1, formed thereon, which slide under the place, K, affixed on the table of the machine, there being a raised plate, L, affixed on the table, which acts as a guide to the plates, G^1. By this arrangement it will be seen that the lever, I, being lowered, the ring, G, is capable of being moved back so as to allow of a bent bar of railway tyre from the previously described machine being introduced between the ring, G, and the pressing rollers, M, N; and when it has been introduced, by raising the lever, I, it will force the ring, G, towards the rollers, M, N, and the bent bar of railway tyre is held between the rollers, M, N, and the ring, G, and the bar of railway tyre will be completely

bent into form by the rollers, M, N, being each caused to pass half way round the ring, G, pressing the railway tyre into shape as they move round. The rollers, M, N, are respectively carried by arms affixed to two segments of wheels, O, P, and the arms, O^1, P^1, which carry the rollers, M, N, move in curved slits formed through the bed or table, as is shown. Q, is a pinion on the shaft or axis, R, which receives motion from a steam-engine or other power by means of a bevilled cog-wheel, S, which takes into and drives one or other of the cog-wheels, T, U, on the axis, R, according as it is desired to cause the rollers, M, N, to move from their present position to the opposite side of the ring, G, or back again to their present position.

I will now describe the fourth part of my invention, which relates to hardening the working surfaces or periphery of railway wheels, in order to render such surfaces more durable. In carrying out this part of my invention, I place one or more railway wheel tyres into a circular oven of brick, fig. 18, and in contact with the working surfaces thereof, I introduce ground charcoal for the purpose of permanently hardening the iron. I then close the oven, and heat it by external flues, and raise it to a good red heat, and retain it at that temperature for two days or more, and then withdraw the tyres from the furnace or oven used, and place such tyre on to a cylindrical form or mould, in order to ensure that the tyre shall be cylindrical; and I plunge the tyre and mould into cold water, and let them remain till cold. The cylindrical mould used for this purpose should be made up of parts so as to separate, in order to get off the tyre readily.

Having thus described the nature of my invention, and the manner in which the same is to be performed, I would have it understood that what I claim is,

First, the mode of constructing hollow axles of railway carriages, as above described.

Secondly, I claim the mode of introducing a ring of wood between the felloe and tyre of a railway wheel, by forming the parts of the wood ring with inclined surfaces, so that by being acted on by inclined surfaces, the wood ring may be expanded. And I also claim the mode of applying felloes of wood to railway wheels, and adjusting the diameter thereof so as to hold the tyre securely by means of the parts, *x*, and *w*, as above described, in respect to figures 10 and 11.

Thirdly, I claim the mode of bending the tyre of railway wheels, as above described; and,

Fourthly, I claim the permanent hardening of the working surfaces of railway wheels, in order to render them more lasting.—In witness whereof, &c.

JOHN OLIVER YORK.

Enrolled June 21, 1842.

Specification of the Patent granted to ISHAM BAGGS, *of King's-square, in the County of Middlesex, Chemist, for Improvements in obtaining Motive Power, by means of Carbonic Acid, and also by a peculiar application of Heated Air.*—Sealed February 9, 1842.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention of improvements in obtaining motive power by means of carbonic acid, consists of so constructing machinery and apparatus, that suitable chemical matters may be employed to evolve carbonic acid gas; the pressure of which acting against a piston in a suitable cylinder or engine produces motive power; and the carbonic acid gas having been thus employed is allowed to pass from the cylinder or engine into a vessel containing suitable chemical matters to absorb or take up the carbonic acid,

and thus for a time destroy the force previously possessed, and by a constant repetition of these changes, using the same materials over and over again, a very powerful engine, occupying but a small space, may be constructed, owing to the great force exerted by carbonic acid when in the form of gas. And in order that my invention may be fully understood and readily carried into effect, I will proceed to explain the drawing hereunto annexed.

Description of the Drawing.

The drawing represents a section of the apparatus used for evolving carbonic acid in the form of gas, and for again absorbing that gas when it has been used for moving a piston in a suitable engine or cylinder. *a*, is what I call the generator, which consists of a strong vessel, into which the chemical matters employed are introduced; and the matters I employ for generating carbonic acid, and evolve it in the form of gas, are the super-sulphate of ammonia and carbonate of ammonia, which are respectively contained in the two vessels, *b*, and *c*, and these matters are constantly introduced by the pumps, *d*, and *e*, they having cocks to regulate the two materials, that they may be sent into the vessel, *a*, in proper quantities in relation to each other, so as to evolve the whole of the carbonic acid contained in the carbonate of ammonia, and this will readily be judged of by having a pressure guage and safety-valve to indicate the pressure, and the pumps are to be driven by any suitable machinery from the engine. The gas evolved from the combination of the two liquors from the vessels, *b*, and *c*, so introduced into the vessel, *a*, will pass off by the pipe or tube, *f*, to a cylinder or engine having a piston and piston-rod in like manner to a steam-engine, having suitable valves or slides for opening and closing the ports for the induction and eduction of the carbonic acid gas.

I have not thought it necessary to show the engine, as the same will readily be applied by an engineer, the only difference being in the greater strength of metal which will be required for an engine to be worked by carbonic acid in the form of gas in place of steam, all which, however, is well understood and will readily be constructed by an engineer, according to the power and size of the engine desired to be made, taking care that the generator is of sufficient capacity to supply the cylinder. The pipe, *f*, in passing to the cylinder or engine passes through the vessel, *g*, and is coiled therein, as is shown. The object of this arrangement is, that as the gas passing through the pipe will be at a very low temperature, it will receive heat by taking up heat generated in the vessel, *g*, by the coming in of carbonic acid from the eduction way of the engine or cylinder, such carbonic acid being conducted from the eduction way of the cylinder into the vessel, *g*, by means of the pipe, *h*, such pipe dipping into the liquor in the vessel, *g*, as is shown, and such liquor is a solution of ammonia, which, quickly taking up the carbonic acid, reduces the pressure thereof on the eduction side of the piston; and it is desirable to keep down the temperature of the liquor in the vessel, *g*, by passing the pipe containing the cold carbonic acid through the vessel, *g*, as above explained, as on the one hand the expansive force of the carbonic acid gas passing to the engine is thereby enhanced, whilst the liquor contained in the vessel, *g*, is prevented volatilizing; but in order to ensure the complete taking up of the carbonic acid brought from the engine by the pipe, *h*, into the vessel, *g*, there is a second vessel, *i*, used also containing a solution of ammonia, and the vessels, *g*, and *i*, are connected by the pipe, *j*, and any gas not absorbed will pass into the vessel, *i*, and be there taken up, and in case of too much pressure there is placed the pipe, *k*, rising to a considerable height so as to prevent the pressure injuring the

vessels, *g*, *i*, or safety-valves may be used. In the progress of working, the liquors contained in the vessels, *g*, and *i*, will be converted into carbonate of ammonia, and the same must from time to time be drawn into the vessel, *c*, by the pipes, *l*, and the vessels, *g*, and *i*, are to be kept supplied with a solution of ammonia in order to take up the carbonic acid as it comes from the eduction way of the engine, and the vessels, *g*, and *i*, are supplied with a solution of ammonia by a pipe, *m*, which is connected with the vessel, *n*, into which the solution of ammonia is received from the still, *o*, into which still the sulphate of ammonia is drawn, which is from time to time withdrawn from the generator, *a*, and conveyed to the vessel, *p*, the formation of sulphate of ammonia in the generator being the consequence of the evolution of carbonic acid gas from the mixture of the super-sulphate of ammonia and the carbonate of ammonia, and by submitting the sulphate of ammonia to heat in a suitable still or retort, *o*, a portion of the ammonia is driven off in the shape of vapour, which is absorbed by the water contained in the vessel, *n*, the remaining matter in the still being the super-sulphate of ammonia, which may be drawn off in the vessel, *b*; and it may be here remarked, that it is not necessary that the operations of obtaining the super-sulphate of ammonia and ammonia from the sulphate of ammonia should be going on simultaneously with the working of the other parts of the apparatus, for if the vessels, *b*, and *c*, and the vessel for receiving the sulphate of ammonia are sufficiently large, the engine may be worked for a considerable period without the recovery of the ingredients by the still, that process being applied at any convenient period; thus it will be seen that the matters are used over and over again in generating carbonic acid in the form of gas, and using it as a means of moving the piston of a suitably constructed engine, which gas is then absorbed or taken up so as to remove the

pressure of the gas from the eduction side of the piston. I would remark, I am aware that carbonic acid has before been attempted to be used as a means of obtaining power, but in such case it was acted on by heat to expand, and cold to contract, its bulk, and a patent was obtained several years back by Mark Isambard Brunel, now Sir Mark Isambard Brunel, for such means of employing carbonic acid; I do not, therefore, claim to use carbonic acid generally as a means of producing power. And it should be stated, that I am aware that the chemical properties of the matters employed are well known; I do not, therefore, claim any novelty in evolving carbonic acid gas by combining super-sulphate of ammonia and carbonate of ammonia when separately considered, nor do I claim the absorbing of carbonic acid by means of a solution of ammonia, neither do I claim the obtaining of ammonia by submitting sulphate of ammonia to heat when separately considered: the object of the invention being to combine those three processes with a suitable engine, so that the power of the evolved gas may be exerted on the piston of such engine before the gas is absorbed or taken up. It should be stated, that although I believe that the chemical materials above-named are the best and cheapest for evolving and absorbing carbonic acid, there are other matters acting in a similar manner; I do not, therefore, confine myself to the precise means herein described, so long as the peculiar mode of working herein described be retained, whereby carbonic acid in the form of gas is evolved and used as a means of pressure to obtain motive power, and then absorbed, and the matter used for evolving and absorbing the gas are used over and over again, as above described.—In witness whereof, &c.

DISCLAIMER

Entered by the said Isham Baggs with the Clerk of the Patents of England, pursuant to an Act passed in the

5th and 6th year of the reign of his late Majesty King William the Fourth, entitled, "An Act to amend the law touching Letters Patent for Inventions:"—

I, the said Isham Baggs, do declare that since I obtained the said letters patent, I discovered that the invention which was intended to have been described under that part of the title which is contained in the following words,—"and also by a peculiar application of heated air," is not of such practical utility as would make it desirable to retain it in the said patent, for which reason I am desirous to and do hereby disclaim all that part of the title which is contained in the following words,—"And also by a peculiar application of heated air."—In witness whereof, &c.

Isham Baggs.

Enrolled August 9, 1842.

Specification of the Patent granted to George Haden, *of Trowbridge, in the County of Wilts, Engineer, for Improvements in Apparatus for Warming and Ventilating Buildings.*—Sealed February 15, 1842.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention of improvements in apparatus for warming and ventilating buildings consists in the adaptation or application to the external sides of stoves, grates, or other warming apparatus of certain metallic plates or zigzag pieces, which being cast into or otherwise fixed to the sides of the stove or grate, increase the extent and effect of the heating surfaces, and cause currents of air to pass with considerable rapidity in close contact with these heated surfaces, the air thereby becoming warmed, and which warmed air may then be conducted to any room or apartment that may require its temperature raised. In

order that my invention may be perfectly understood, I have appended hereto a sheet of drawings, representing various modes of carrying my invention into effect.

Fig. 1, is a front external elevation of a close stove of a rectangular form, the front casing being removed. And,

Figs. 2, 3, 4, and 5, represent other external views of the same, observing also that in these the outer rectangular casing is removed.

Fig. 6, is a section taken horizontally through the stove and its air passages, the surfaces of the top and four sides of the stove are furnished with projecting plates of metal, *a*, *a*, *a*, *a*, which may be straight and ranged in angles, or bent or curved in any way that may be thought most desirable. These plates vary in projecting depth from one inch to twelve inches, or more, according to the size of the stoves, and they may be arranged in any directions and at any angles with reference to the sides that may be found most convenient. The sides of the stoves being furnished with any number of these plates, and arranged in any convenient manner, as said, the stove may be covered or surrounded with a casing of any suitable material, which, as it must touch the outer edges of the projecting plates, *a*, *a*, *a*, *a*, will form a number of zigzag channels. Through these channels atmospheric air is conducted from below through apertures made for that purpose.

As metals of all descriptions are known to be good conductors of heat, the projecting plates which are connected to the sides of the stove soon become heated by the fire within, and the air being obliged to pass in narrow streams between these plates soon becomes warmed, and on arriving at the top may be conducted off through a pipe or flue to any apartment that requires warming, or may be allowed to pass at once into the room which contains the apparatus. Straight or bent plates are equally applicable, and the apparatus may be also employed for diffusing heat derived from hot water,

as shown in the horizontal section, figure 7, or from steam or gas.

I prefer the projecting plates to be cast on to the sides of the stove so as to form a component part thereof, but I do not confine myself thereto, as they may be affixed to the side of the stove by hard solder. The air to be warmed is admitted to the apparatus through suitable holes or apertures made at the lower part of the casting, or in its bottom, and which air, in passing up the narrow channels becomes warmed, and ultimately escapes at the upper part through similar holes or flues, or may be conducted off to some other apartment, as before-mentioned.

Pure atmospheric air may be supplied to the apparatus by means of pipes or flues leading from the outside of the building, and by thus causing a constant draft ventilate the apartment.

One of the principal advantages derivable from my invention is the increased extent of heating surface, which is obtained by the application of the projecting plates, whereby a small stove constructed according to my invention may be made to give out as much or more heat than one of larger dimensions having plain sides, as at present made.

Having now described my invention and the manner of carrying the same into effect, I claim as the invention secured by the hereinbefore in part recited letters patent, the application of projecting plates or pieces placed in zigzag ranges, and at any angles on the sides or surfaces of grates, or stoves, or other apparatus for diffusing heat by radiation and rapid circulation of the atmosphere.—In witness, whereof, &c.

GEORGE HADEN.

Enrolled August 15, 1842.

Specification of the Patent granted to WILLIAM NEWTON, *of Chancery-lane, in the County of Middlesex, Civil Engineer, for certain Improvements in regulating the flow of Air and Gaseous Fluids.*—(Communicated by a Foreigner residing abroad.)—Sealed February 25, 1842.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.— This invention, which has been communicated to me by a certain foreigner residing abroad, consists of a peculiar construction of apparatus, in which, upon the slightest increase of pressure from the air or gas which passes through the apparatus, the flow of the said air or gas is restricted and regulated in a novel manner, until the extra pressure has ceased.

In order that the invention may be perfectly understood, I have shown in the accompanying drawings various views of the improved apparatus, whereby the supply or flow of air or gas to the burners is regulated.

Fig. 1, is a side elevation of the apparatus complete.

Fig. 2, is a vertical section taken through the middle of the same.

Fig. 3, is a horizontal section of the apparatus taken in the line, A, B, of figure 2.

Fig. 4, is a top or horizontal view, the lid or cover being removed. And,

Fig. 5, is another horizontal section taken in the line, C, D, of figure 2.

The working parts of the apparatus are contained within the outside metal casing, *a*, *a*, *a*, *a*, which is supplied with a moveable lid or cover, *b*, *b*, an annular moveable bell-shaped vessel, *c*, *c*, *c*, *c*, is placed in the interior of the metal casing, *a*, *a*, covering the aperture, *d*, *d*, by which the gas or air enters the bell-shaped vessel, and through which its flow or passage is regulated

by means of the conical end, *e*, of the hollow tube, *f*, *f*, which is suspended by means of the metal rod or chain, *g*, from the inside of the bell-shaped vessel, *c*, *c*. The aperture, *d*, *d*, is formed at the upper circular end of the metal cylinder, *h*, *h*, *h*, *h*. This cylinder is supported by the annular chamber or gallery, *i*, *i*, *i*, *i*, and when once placed in its proper position it remains stationary, and is prevented from moving laterally or out of its position by the small blocks, *j*, *j*. The apparatus is supplied with water from above by removing the lid or cover, *b*, *b*, and its level inside is seen by means of the glass tube, *k*, *k*, outside. All the different parts of the apparatus that are to be filled with water are made to communicate with each other, the water passing from the upper to the lower part through the holes, *l*, *l*, *l*, *l*, seen in fig. 5, and when the apparatus requires emptying, the water is allowed to flow out through the aperture, *m*, by removing the screw.

The bell-shaped vessel, *c*, *c*, is suspended by rods or chains, *n*, *n*, from the ends of the levers, *o*, *o*, and the weight of the vessel, *c*, together with the hollow tube, *f*, *f*, is counterbalanced by the weights, *p*, *p*, at the opposite ends of the levers, *o*, *o*. Gas or air flows into the apparatus from the pipe, *q*, and passes up the annular space, *r*, *r*, *r*, *r*, in the direction of the arrows, and through the aperture, *d*, *d*, into the upper part of the vessel, *c*, *c*, from hence it passes down the annular passage, *t*, *t*, and finally escapes from the apparatus through the pipe, *u*.

If the pressure of the air or gas into the apparatus is too great for the consumption thereof, it presses on the surface of the water and against the domed part of the vessel, *c*, *c*, thereby causing the latter to rise and draw the conical end, *e*, of the hollow tube, *f*, *f*, up into the aperture, *d*, *d*, and thereby contract the same, and not allow so great a quantity of gas to enter the vessel, *c*, *c*. When by the issue of the gas from the apparatus the equilibrium or proper pressure is restored, then the vessel, *c*, *c*, sinks again, and allows the conical end of the tube,

f, *f*, to descend also from the aperture, *d*, and permit the gas to enter the apparatus as before.

Having now described the invention that has been communicated to me, I wish it to be understood, that I do not intend to confine myself to the precise forms or parts herein shown, nor to the materials of which the same is to be composed; but I claim as the invention secured to me, under the hereinbefore in part recited letters patent,

First, the peculiar arrangement of apparatus herein shown and described, or any modification thereof; and,

Secondly, any apparatus for regulating the flow of air or gas in which such regulation is effected, by means of a conical plug or the conical end of a tube, either hollow or solid, rising into the aperture through which the gas passes, and thereby closing or partially closing the same, and preventing the air or gas from passing, as above described.—In witness whereof, &c.

WILLIAM NEWTON.

Enrolled August 25, 1842.

Specification of the Patent granted to OSBORNE REYNOLDS, *of Belfast, in the Kingdom of Ireland, Clerk, for Certain improvements in covering Streets, Roads, and other Ways with Wood; and also in the means of enabling Horses and other Animals to pass over such Roads and other slippery Surfaces, with greater Safety than heretofore.*—Sealed March 25, 1842.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—My invention of certain improvements in covering streets, roads, and other ways with wood, and in the means of enabling horses and other animals to pass over the same with greater safety than heretofore, may be divided into two parts, and consists,

Firstly, in various improvements upon a former invention, for which I obtained a patent on the 27th April, 1841, for improvements in paving streets, roads, and ways; and,

Secondly, in a novel method of making the shoes of horses and other animals, to prevent them from slipping, and giving them a firmer hold on the pavement.

In order to form a firm, compact, and cheap paving, I first level the ground and ram it hard, covering it also with sand, if desirable. Upon this I lay boards, planks, beams, laths, or slips of wood, either in close contact or with any intervals between them, and upon these boards so arranged, I place blocks of wood of any form. The form of blocks which I prefer are a parallelopipedons, or other figures, such as may be formed by one cut, either oblique or perpendicular to the grain of the wood, from a plank of any breadth and of any thickness not exceeding four inches. I also use blocks formed similarly from round or unhewn timber. If desirable, I place a second or even a third layer of boards on the first, imbed them wholly or partially in cement, nail or otherwise fasten them together. If desirable, I intersperse between those sides of blocks which are in contact, a few grains of gravel or other hard substance, not smaller than spheres whose diameter is one-twentieth of an inch, so that these grains may be partially imbedded in each of two adjacent sides, and thereby strengthen their mutual support. To make the pavement water tight, I surround the blocks, when desirable, with cement, and to unite the whole compactly together, I secure the blocks to the foundation planks, or to each other, or both, by nailing or pinning each block to the mass already formed. This method of fastening the blocks together is obviously different from any of the methods hitherto employed of securing a number together by means of pegs, pins, or dowels. To roughen the surface, I scatter upon it by the hand or other instrument, gravel or broken stone, screened so as

to contain neither dust nor sand, nor grains of any size less that that described above. I scatter this gravel in any quantity not exceeding four pounds avoirdupois to the square yard. This operation I repeat often enough to keep the surface constantly rough. This repetition, combined with the use of grains of a proper size, alone produces the whole effect desired, without the accumulation of mud or dust, which always accompanies the use of gravel as it has hitherto been employed for this purpose.

The second part of my invention consists in forming bars, ribs, or projections on that part of the underside of horse-shoes which is between the toe and the caulk, for the purpose of preventing horses from slipping.

Fig. 1, in the accompanying drawing represents the under side of a horse shoe constructed in this manner; and,

Fig. 2, is a side view of the same. *a, a, a, a,* are the bars, ribs, or projections formed on the under part of the shoe, and *b, b, b,* are three ribs which form the toe of the shoe. I do not intend to confine myself to the precise arrangement herein shown, as it may be varied without departing from the nature of my invention.

Having now described my invention, and the manner of carrying it into effect, I claim,

Firstly, the method herein described of using boards for a foundation of wood pavement, also the use of blocks of the forms described, together with the modes described of strengthening the whole by means of hard grains of gravel and nails of iron or pins of wood; and further, the method described of roughening the surface continually by gravel or broken stone.

Secondly, I claim the improved method herein shown of constructing the shoes of horses and other animals, whereby they are prevented from slipping, as above described.—In witness whereof, &c.

Osborne Reynolds.

Enrolled August 25, 1842.

Specification of the Patent granted to MARK FREEMAN, *of Sutton Common, in the County of Surrey, Gentleman, for Improvements in the Construction of Inkstands.*— Sealed March 21, 1842.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.— In order that my invention may be fully understood and readily carried into effect, I will proceed to describe the drawings hereunto annexed.

Description of the Drawings.

Fig. 1, represents a front view of an inkstand constructed according to the first part of my invention.

Fig. 2, shows a plan thereof.

Fig. 3, represents a side view.

Fig. 4, is a side section thereof, the cover of the dipping-cup being closed.

Fig. 5, shows a similar side section, the cover of the dipping-cup being raised, and the ink has thereby been caused to flow into the dipping-cup by pressing down the float.

Figs. 6 and 7, show separate views of the cover of the dipping-cup and of the float. In each of these figures the same letters indicate similar parts. *a*, a^1, is the inkstand, consisting of two chambers opening into each other at *b*, and ink is supplied at the opening, *c*, which opening has an air-tight cover screwed thereon. *d*, is the dipping-cup, which opens into the chamber or compartment, a^1, of the inkstand, there being a hole at *e*, for the passage of ink from the compartment, a^1, into the dipping-cup; or the dipping-cup may communicate with the other chamber by a tube descending nearly to the bottom. *f*, is a cover fitting into the upper part of the compartment, a^1, of the inkstand. *g*, is the cover of the dipping-cup, which moves on a hinge joint, as is shown; and there is

a projecting finger, g^1, to the cover of the dipping-cup, which passes into the compartment, a^1, of the inkstand, and is the means of depressing the float, h, which is placed in the compartment, a^1, as is shown, and moves freely therein. This float I make of cork, and coat it with coachmakers' japan-varnish, or sealing-wax. The float may, however, be made of other materials. At the upper part of the float a rack is formed by means of a series of pins, as is shown at i, between which the finger, g^1, enters, when the cover, g, of the dipping-cup is being opened, and the float is thereby depressed, and a quantity of ink will be displaced, and will rise up the groove, j, formed in the float, and such ink will pass into the dipping-cup.

It will readily be understood, that when the cover, g^1, of the dipping-cup is again closed, the float will be released, and it will rise to the surface of the ink,—the ink in the dipping-cup flowing back into the compartment, a^1. As the vessel, a, a^1, becomes empty, the float will descend low down, and the finger will act on the upper pins of the float. In order that more ink may flow into the compartment, a^1, out of the compartment, a, it will be necessary to unscrew the cover of the opening, c, which will cause the ink in both compartments to be on the same level, and when the cover of the opening, c, is again screwed down, the ink cannot return into the compartment, a, when the float is caused to descend, as above described, by opening the cover of the dipping-cup. I would remark, that I do not confine myself to the shape of the inkstand shown, so long as it is arranged as above described.

I will now describe the second part of my invention.

Fig. 8, shows a side view of an inkstand constructed according to this part of my invention.

Fig. 9, shows a plan thereof.

Fig. 10, shows a side section, the dipping-cup being empty.

Fig. 11, shows another side section, the dipping-cup being supplied for use; and,

Fig. 12, shows a plunger in plan and side view separately. This inkstand, like that above described, is composed of two compartments, opening into each other by means of an opening, *b*. Ink is supplied to the compartment, *a*, through the hole, *c*, into which the tube of the dipping-cup, *d*, is screwed, as is shown, or the dipping-cup may communicate with the compartment, a^1, and the opening, *c*, have an air-tight cover. *f*, is a cover fitting the upper part of the compartment, a^1, of the inkstand. This inkstand acts in a similar manner to that above described; but in place of using a float, *h*, there is a plunger used, which is worked up and down by a screw, as is shown, the plunger, *h*, being prevented turning in the compartment, a^1, by means of a stud or projection which enters the groove formed in the plunger, as is shown. In raising ink into the dipping-cup, the plunger is caused to descend; and when the plunger is again raised, the ink remaining in the dipping-cup will return into the compartment, *a*, of the inkstand. In order that more ink may flow into the compartment, a^1, and out of the compartment, *a*, it will be necessary to unscrew the dipping-cup or cover of the opening, *c*, which will cause the ink in both compartments to be in the same level; and when the dipping-cup or cover of the opening, *c*, is again screwed down, the ink cannot return into the compartment, *a*, when the plunger is caused to descend. I would remark, that this inkstand may be varied in its shape, so long as the peculiar arrangement of parts be retained, whereby a compartment, a^1, with a plunger therein, is combined with and opens into another compartment, *a*, having a suitable dipping-cup applied thereto, such dipping-cup being supplied with ink by the displacement caused by the plunger, as described.

I will now describe the third part of my invention, which differs somewhat from the previous arrangements,

inasmuch as in the before described inkstands there is air required to be admitted into the compartment, *a*, from time to time, as the ink contained in the compartment, a^1, becomes used up, but according to the present arrangement air will flow into the compartment, *a*, from the compartment, a^1, as the ink becomes used up. In this part of my invention the inkstand is composed of two compartments opening into each other at the opening, *b*, the lower end of the float or plunger used being capable of descending below the opening, *b*, as will be seen in the two sections, figures 13, and 14, one section figure 13, showing the float or plunger at its highest position, and the other section showing the plunger at its lowest position, the ink into which the pen is to be dipped being above the plunger, and in figs. 13*, and 14*, there is a variation, inasmuch as there is a dipping-cup used, but the plunger acts in the same manner by descending below the opening, *b*, the other parts of figs. 13*, and 14*, being similar to the inkstand first described. In the inkstands shown at figures 13, 14, and 13,* and 14*, it will be found that as the ink becomes used up and will not fill the space below the opening, *b*, fresh ink will flow from the compartment, *a*, into the compartment, a^1, and air will pass through the opening, *b*, the parts being so arranged in respect to each other that the compartment, a^1, will be supplied in a like manner to the action of the bird-glass or fountain, so soon as the ink in the compartment, a^1, is used up to such an extent as not to come above the opening, *b*, air will flow into the compartment, *a*, and ink will flow from the compartment, *a*, into the compartment, a^1, till the ink again stands above the opening, *b*. It will, therefore, be evident that the whole of the ink in the compartment, *a*, may be brought into the dipping-place or cup by the simple action of the plunger or float without requiring any opening of the compartment, *a*, by hand, as is necessary in the former inkstands. The plunger or float in the

present inkstand may be pressed down by any convenient means, that at figures 13*, and 14*, is acted on by a finger in like manner to that first described. In the inkstands at figures 13, and 14, the lid does not move up and down, but there is a pivot, *t*, attached to it which works in a projecting piece, *u*, attached to the inner surface of the compartment, a^1, and on the lower part of this pivot there is a screw of greater diameter, forming a shoulder against the under surface of the projecting piece, which screw works in a female screw formed in the plunger, so that in turning the lid of the dipping-place this screw forces down the plunger, and in shutting causes it to rise. A stud or projection is attached to the inner surface of the compartment, a^1, above the bearing, *u*, in which the pivot, *t*, works, and another stud is attached to the outside of the compartment, a^1, a^1, *k*, and when the dipping-place is closed these studs are received by two inclined planes attached to the lid in such a manner as to force down the lid on the top of the dipping-place, to make the inkstand air tight for travelling.

I will now proceed to describe the fourth part of my invention, which relates to a mode of supplying ink from an inkstand to a dipping-cup, and for returning the ink from the dipping-cup back into the inkstand by means of a syphon.

Fig. 15, shows a plan of an inkstand constructed according to this part of my invention.

Fig. 16, is a side section thereof, showing the dipping-cup empty; and,

Fig. 17, shows another section of the inkstand, the dipping-cup being filled. *l*, *l*, is the frame or stand of wood or other material for holding the inkstand; *m*, is a vessel of glass or other suitable material; *n*, is a cover fixed at the upper part of the vessel, *m*; and *o*, is an opening by which ink is supplied to the vessel, *m*, there being a small hole through the cover in order that the

outer atmosphere may have free passage into the vessel, *m*. The ink contained in the vessel, *m*, is caused to flow into the dipping-cup, *p*, by means of a bent tube, *q*, which forms part of the handle by which the inkstand is carried, as is clearly shown in the drawing; the part of the tube, *q*, which passes through the cover of the vessel, *m*, has a screw formed thereon, which, passing through a female screw formed in the cover of the vessel, *m*, is the means of raising the vessel, *m*, when that vessel is moved round, by which means the level of the ink in the vessel, *m*, will be raised to such a height as to bring the syphon into action to fill the dipping-cup. Thus supposing the vessel, *m*, to be in the position shown in figure 14, if the vessel, *m*, were turned round so as to cause it to rise up the tube, *q*, the level of the ink being raised above the end of the tube, *q*, ink would flow into the dipping-cup, as is indicated by fig. 17, and as the ink is used by again raising the vessel, *m*, by turning it on the screw of the tube, *q*, a further supply to the dipping-cup would take place, and when it is desired to return the ink which may remain in the dipping-cup into the vessel, *m*, that may be done by turning the vessel, *m*, in an opposite direction, which will cause it to descend on the tube, *q*, and the ink will flow back into the vessel, *m*. In order to fill the syphon in the first instance, I use a tube and funnel, *r*, shown by dotted lines, which screws into the dipping-cup, as is shown. I then pour ink down the tube, *r*, by which the syphon tube, *q*, will be filled, and in this manner the vessel, *m*, may be supplied with ink, if preferred. I would remark, in respect to this part of my invention, that it will be evident that in place of the vessel, *m*, moving, and the syphon and dipping-cup remaining stationary, the inkstand may be so made that the vessel, *m*, may remain still, and the syphon and dipping-cup move so as to lower and raise the dipping-cup, in respect to the level of ink in the ink vessel, *m*, and the parts may

be varied in shape, so long as the mode of combining the dipping-cup with the ink vessel, by a syphon, in the manner above described, be retained.

Having thus described the nature of my invention and the manner in which the same is to be performed, I would have it understood, that what I claim is,

First, the mode of constructing inkstands by combining two compartments, *a*, and a^1, opening into each other with a float or plunger in the compartment, a^1, and a dipping-cup opening into either of the compartments, as above described, in respect to figures 1, 2, 3, 4, 5, 6, and 7.

Secondly, I claim the mode of constructing inkstands by combining two compartments, *a*, and a^1, opening into each other, and the compartment, a^1, having a plunger working within it, either compartment having a dipping-cup applied thereto, as above described, in respect to figures 8, 9, 10, 11, and 12.

Thirdly, I claim the mode of arranging the communicating hole, *b*, between two compartments of an inkstand, in one of which a plunger or float works, so that the lower part of the float may pass below the opening, *b*, as described in respect to figures 13, 14, and 14*. And,

Fourthly, I claim the mode of constructing inkstands by combining a dipping-cup with an ink vessel, *m*, by means of a syphon, in such manner that the positions of the vessel and of the dipping-cup may be varied, as above described, in respect to figures 15, 16, and 17.—In witness whereof, &c.

MARK FREEMAN.

Enrolled September 21, 1839.

Specification of the Patent granted to JOHN VENABLES, *of Burslem, in the County of Stafford, Earthenware Manufacturer, and* JOHN TUNNICLIFF, *of Burslem, aforesaid, Bricklayer, for a New and Improved*

Method of Building and Constructing Ovens used by Potters and China Manufacturers in the Firing of their Wares.—Sealed November 20, 1841.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—That whereas the ovens ordinarily used by potters and china manufacturers in the process of firing their wares, both in the biscuit state and in the gloss state (or glazing process), are so constructed as to require a much larger consumption of fuel relatively to the quantity of ware therein contained than is needful according to our method hereafter explained, and the manufacturers thereby incur much unnecessary expense; we propose, by means of our invention, to obtain additional room in the ovens for the wares intended to be fired, whether contained in saggars or not (saggars being earthen pans or cases in which the wares are usually enclosed during the process of firing): and this we are enabled to do by placing the outer row or rows of the naked wares or the outer and larger circle or circles of saggars (if the wares are fired in saggars), close against the sides of the oven, all round the same upon a ledge or shelf, or two or more ledges or shelves, or other basis which we construct in the oven between the sides thereof, and the vents or orifices of the bags or flues by which the oven is heated, and we thereby enlarge the capacity of the oven for the firing processes to the extent of such ledge or shelf, or ledges or shelves, or other basis, and are enabled to place in the oven a much larger quantity of goods for the firing processes, and to complete such processes by the expenditure of no extra quantity of coals or other fuel, and in as short or even a shorter space of time than is required for the firing processes in ovens of equal dimensions heretofore in use. We deem it necessary here to explain, that the ovens in ordinary use have no such ledge or contrivance, and for want thereof a great portion of the heat is spent

upon the oven sides which might be applied to the benefit of the manufacturer, and will be so applied by means of our invention. For the better explanation of our invention we refer to the drawings annexed to this specification, in which

Fig. 1, represents the exterior of the oven for the improved construction of which our patent is obtained, but the exterior form of the oven constitutes no essential part of our improvement. The bands which are represented as encircling the oven are of iron linked together, the same as in ordinary ovens. The letters, A, A, A, in figure 1, show the arches over the oven mouths or fire-places at which the fuel is supplied, and which are upon a similar construction to the mouths or fire-places of ordinary ovens, except that the arches, lintels, or bearings over the mouths of our ovens are constructed of greater depth or thickness than in ordinary ovens, for the purpose of enlarging the interior capacity of the oven above the arches, lintels, or bearings, and these arches, lintels, or bearings, with the other brickwork in the base of the oven, support the ledges or shelves shown in figure 2, hereafter referred to. But it is not absolutely necessary for the purposes of our invention that arches should be used, but lintels or any other architectural contrivance, whereby the side walls of the oven can be supported over the oven mouths, may be indifferently employed. The letter, B, in figure 1, shows the entrance to the inside of the oven, which is walled up during the process of firing, and is in no respect different from the ovens in ordinary use.

Fig. 4, shows the ground plan and horizontal section of our oven, with the oven mouths, and bags, or flues. The upper half of this circle (marked No. 5), shows a section of our oven with distinct bags or flues and arched fire-places, taken above the floor. The lower half of the same circle (marked No. 6), shows the foundations of the oven with the flues under the floor, and a continuous

circular bag or flue, together with the basis of brickwork on which we place the outer row or rows of ware or saggars, as in figure 2, letters, x, x, and which basis includes the space in the oven bottom on which the outer row of wares or saggars may be raised from the floor, as represented in figure 3, letters, z, z. The number of the fire-places, and bags, or flues in every oven is in proportion to the size of the oven. Their number, form, or shape is no essential part of our improved oven, nor do we rely upon the particular construction of the bags or flues of our ovens any farther than as they are necessarily adapted by their special position to the interior of such oven, as hereinafter specified.

Fig. 2, contains a vertical section of our oven, showing the base thereof, with the fire-places and flues, and the superstructure and interior of the oven. The ledges or shelves on either side marked with the letters, x, x, constitute the peculiarity of our oven, and for which we claim to maintain exclusive right under our patent. Upon these ledges and round about the whole interior of the oven we place the outer row of wares or circle of saggars for the process of firing, whether the wares be china or earthenware, and whether in the biscuit or gloss state. A portion of this outer row of wares or circle of saggars is represented in figure 2, and the tiers of saggars (which are usually called bungs by the workmen), are there marked with the letter, F. The width of this ledge will vary or admit of variation according to the room required for the naked wares or circle or circles of saggars placed thereon for the firing processes; and though we consider ledges or shelves, as represented in figure 2, to be the most convenient and preferable kind of support for the outer rows of wares or saggars, we also obtain the same end, though in a manner we consider less advantageous, by constructing our oven without any such ledges or shelves, as in figure 3, and by placing the outer rows of ware or circles of saggars upon and rearing the same

from the bottom or floor of the oven, as represented in that figure. For each of these contrivances we claim the benefit of our patent, the great advantage and peculiarity of which consists in our introducing the heat through vents or orifices in the floor or by flues or bags raised above the floor, in and along the inner side of one or more row or rows of naked ware or saggars placed round the oven walls, and thus admitting of a much larger quantity of goods being fired in our improved oven than can be fired by means of an equal quantity of coals or other fuel in any oven of the same size and dimensions constructed in the method heretofore ordinarily used by potters and china manufacturers. In figure 2, of the annexed drawings, over and along one side thereof, an outline marked with the letters, H, H, H, is intended to represent an extension of the upper part of our oven, by constructing an additional ledge or shelf for receiving a row of ware or circle of saggars behind the row or circle resting upon the ledges or shelves, marked X, X, in the same figure. An oven constructed with this extension we call a double-ledged oven. It requires a corresponding extension of the depth or thickness of the arches, lintels, or bearings over the oven mouths in order to support such additional ledge, and which may be made subservient to the firing of a still greater quantity of ware with the same quantity of fuel than can be fired in an oven constructed with a single ledge or shelf, as shown in figure 2, when divested of that portion shown by the outline, H, H, H. This additional ledge will be formed as represented in figure 2, by the dotted line under the letter, Y. Now whereas we claim as our invention the construction of an oven with one or more ledge or ledges, as shown at X, in figure 2, and indicated by the dotted line above the letter, Y, in the same figure, and also the construction of an oven without any ledge or shelf but with flues or vents either raised above the floor of the oven, as shown at I, in figure 3, or not at all raised, but being simply

orifices in the floor, as shown at K, in the last-mentioned figure. And whereas our said invention enables us in each of such several modes of construction to place one or more row or rows of ware or circle or circles of saggars behind the flues or vents, and thereby greatly to enlarge the capability of the oven for the processes of firing, without the expenditure of any extra quantity of coals or other fuel whatever: And such our invention being to the best of our knowledge and belief entirely new and never before used within that part of Her said Majesty's United Kingdom of Great Britain and Ireland called England, we do hereby declare this to be our specification of the same, and that we do verily believe this our said specification doth comply in all respects fully and without reserve or disguise with the proviso in the said hereinbefore in part recited letters patent contained, wherefore we do hereby claim to maintain exclusive right and privilege to our said invention.—In witness whereof, &c.

JOHN VENABLES.
JOHN TUNNICLIFF.

Enrolled May 20, 1842.

Specification of the Patent granted to EDWARD HALL, *of Dartford, in the County of Kent, Civil Engineer, for an Improved Steam Boiler.*—Sealed January 11, 1842.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c., &c.—I do hereby declare the nature of my said invention of an improved steam boiler to consist in the application of one or two side tubes to an ordinary cylindrical tube boiler, so as to extend the heating surface and produce the effects of a larger boiler without augmenting the

space ordinarily occupied by one of smaller size; these external, or as I call them feed heating tubes, are placed in the side flue or flues of an ordinary cylindrical tube boiler, and are connected to the boiler as well as to its lower fire tubes, and the water made to circulate through them, as hereinafter explained. And in further compliance with the said proviso, I do hereby describe the manner in which my said invention is to be performed, by the following statement thereof, reference being had to the drawing annexed, and to the figures and letters marked thereon (that is to say):—

Description of the Drawing.

Fig. 1, represents a side elevation of a cylindrical tube boiler and brick seating taken through the side flues with the feed heating tubes, A, A^1, lying in the flue, and which are supplied with the feed water by means of the pipes, B, at the back, and whence it flows round and past the neck pipe, C, as far as the stopper, D, and then ascends through the top of the tube, A, A^1, at *a*, into the pipe, E, to escape and mix with the water of the boiler, G, at its other extremity, E. The front ends, A^1, of these tubes receive their water from the lower or fire tubes, F, F, which are fed from the boiler, G, above them, through the neck pipe, C.

Fig. 2, represents a transverse section of a tube boiler, taken at the back of the fire-place, and exhibits the arrangement of the two feed heating tubes, A, A, in the side flues in connexion with the fire tubes, F, F, F, beneath and the boiler, G, above them, which are represented by similar letters in figure 1.

Fig. 3, represents a plan of the boiler and seating with the upper flues uncovered, which parts are also designated by similar letters, as in fig. 1. B, B, mark the feed pipes; A, A^1, and A, A^1, the two feed heating tubes, which are now exposed to the action of the heated air in the flues, and convey the feed water to the pipes, E, E^1, and E, E^1, to

the inside of the boiler, G. *c*, *c*, the neck pipes of the tubes, which prevent the feed water from mixing with that which is passing down to the lower tubes, E, from the boiler, G.

Fig. 4, represents a vertical section of the boiler without the brick seating, and taken through the feed heating tube, the fire tube below it, and the boiler above. Similar letters representing the similar parts, as in fig. 1. B, the feed pipe connected to the back ends of the feed heating tubes, A, A^1, which convey the feed water as far as the stoppers, D, and thence up and along the inner pipe, E, E^1, whence it escapes to mix with the water in the boiler. The stopper, D, is adjusted so as to be removed by means of the handle, *m*, when required for clearing the boiler of sediment. During this operation the water from the boiler is passing down the neck pipes, *c*, *c*, and up again into the boiler through the neck, *h*, *h*. In carrying this improvement into effect, I do not find it necessary to confine myself to any particular dimension of boiler or number of tubes or attachment of them to one another; but by preference, I make each of the two feed heating tubes of the same size as the lower tubes, and about the same length. In their construction I prefer fixing each of the two feed heating tubes to the boiler at both ends, and making them an integral part of the same, then connecting those tubes to the lower tubes by a flanched neck towards each end, which are secured together with screw-bolts. I do not claim the use of what I have called feed heating tubes in the flues of boilers generally, as they are known to have been used before; but their application to cylindrical boilers with tubes below them in the fire, as here described, is new, that is, feed heating tubes connected with the tubes beneath cylindrical boilers, and interposed between them and the boiler, without the feed water passing through them being allowed to mix with the water of the lower tubes in its passage into the boiler; and it is to such application and arrangement I ground

my patent for an improved steam-boiler, which, having within itself the means of heating its feed water, approaching to or exceeding the point of ebullition, is productive of very considerable economy in the fuel necessary for generating a given quantity of steam, compared with boilers without such an appendage. And such my invention being, to the best of my knowledge and belief, &c.—In witness whereof, &c.

EDWARD HALL.

Enrolled July 11, 1842.

LAW REPORTS OF PATENT CASES.

Common Pleas, Westminster Hall.

Before Lord Chief Justice TINDAL *and a* SPECIAL JURY.

February 11, 1840.

CRANE *v.* PRICE *and* OTHERS.

(*Mr. Solicitor-General's reply—continued from page* 310.)

Gentlemen,—I beg your attention to dates when I am considering Mr. Crane's patent and his merit. Mr. Crane's patent is dated in September, 1836. Did Mr. Crane bestow one sixpence, did he spend one hour in any experiment before he took out his patent? There is not a tittle of evidence to show that he did. In September, 1836, he launches his patent, and what does he do? sends for Mr. Neilson's man to erect his apparatus; that apparatus is not put in work, according to the evidence, until December or January after he had got his patent; he knew no more about it, when he got his patent, than any other person in England; he cannot show you that he spent an hour or a sixpence, or that he knew anything about it, except that he had the genius to conceive it was best to get a patent, and then to see if anything could be found out which would support that patent. You have

no evidence, (and you may depend upon it you would have had it if the truth or facts had warranted it, or the greatest industry could have furnished it,) you have no evidence that he ever spent an hour, or that it had at all occupied his time, or that he had any knowledge, or genius, or talent on the subject more than the rest of the world; the first you know of him in this respect is getting his patent. What do you know of him then? cannot he erect his own apparatus? No: he applies to Mr. Neilson, gets, as you hear, Mr. Neilson's license, pays Mr. Neilson a remuneration for the use of his patent, and he claims sympathy as being the inventor, and protection because, forsooth, he has rendered the public a service. He talks of the difference in Mr. Neilson's patent (which I shall come to by and by) by these pipes. What has he to do with that? He knows nothing about it; he sends for Neilson's man, M'Kenzie, and gets him to erect the apparatus on Mr. Neilson's plan. They say not the plan described in the specification; we will see that, and also see whether it is material. But he knows nothing about how far the hot blast will answer; he knows nothing about the mode of applying the hot blast, whether the original form in which Mr. Neilson did it or any of the modifications, not the least in the world did he know about it. He sends to Mr. Neilson, or gets M'Kenzie to come and construct his apparatus. In December, 1836, or January, 1837, he begins to operate; he comes to a stand at first; he begins again in February, 1837, and at a date subsequent to the patent, he being utterly ignorant of all upon the subject, there being not a tittle of evidence to show he was apprised of any one circumstance until after he had got this patent. Anything which is said by the gentlemen who are the owners of anthracite property, on Mr. Neilson's patent being found of so much value when applied to stone coal, giving as it does increased value to their property—that they should meet and dine together, and drink one another's healths, can have nothing to do with this

cause. I have no doubt whatever it would be an exceedingly agreeable thing; you know Englishmen always congratulate themselves upon their good fortune by a good dinner, and now and then, among other things, a little speech, and that took place upon this occasion. But what had occurred to deserve a speech but the ingenuity of getting a patent? He gets a patent for the application of somebody else's patent to a known state of things, and that is his merit. The dates are, therefore, extremely material in investigating the claims of these parties. What is the meaning of Mr. Crane getting Mr. Neilson's license? I suppose my Learned Friend is instructed to say, why it was better to be free from all doubt, it was better to pay a sum to Mr. Neilson than to have any litigation. Much better, I admit it would have been, beyond all doubt, to have given credit where it was justly due; but what is the nature of the payment? A shilling per ton. Mr. Neilson has nothing to do with this, this is not his patent plan. Mr. Crane, who has abundance of merit as a man of genius and an inventor, and a patriot, and a benefactor to the public, is also privately extremely generous of having nothing to do with Mr. Neilson's patent; he is kind enough to give him a shilling a ton for all the iron he makes on the application of the hot blast.

Now I beg you to attend a little to Mr. Crane's acts, and contrast them with the advocacy of his counsel. Whoever wishes to oppose a patent, some how or other it does so happen that as soon as they read the specification all their ideas, if they are opposed to patents, become confused, and I never saw a man against a patent who could understand the specification; he will always turn everything upside down; he knows it is written by a man of genius and of science; in all probability he brings to bear the same genius and the same science, but when he reads the specification, instead of applying his knowledge as he would do if he

set to work about it, he continues to misunderstand every part of it, and to forget all those general directions, all those general principles with which those who drew the specification would take for granted it would be read. Specifications are not drawn for persons wholly ignorant of the subject, they are drawn in the expectation that they will be read by men who bring some knowledge of the general principles applicable to the subject, and who have also the same practical knowledge and experience to guide them in the execution of the work. What, if a man says you are to increase the size of your cylinder, witnesses will be sure to increase it in the very figure and form which is the least useful, and will judge of its merits by that form which they choose to assign to it; each witness instead of applying his honest judgment to the case, his practical experience, his knowledge of what is required and the mode of obtaining it—instead of doing that, he reads it, and he gives you a figure and a form which never could have been dreamt to have been in the mind of the framer of the specification, and which is wholly unsuited to the subject. Mr. Neilson announces to the world that the application of the hot blast will be of very great advantage, and Mr. Neilson's patent appears certainly to have much more claim on public attention than a great many of the patents which are obtained; and you will be so good as to bear in mind that everything you have heard upon the subject of the improvement in the manufacture of iron is to be referred, not to any discovery subsequent to Mr. Neilson's, but the mere application of Mr. Neilson's patent, which, in the common course of events, will be found to be extending its application to materials which before were not susceptible of manufacture without such aid, but which are likely to be brought into operation now. I dare say it yet remains for a vast many articles to be discovered that may be usefully operated on and brought into manufacture by Mr. Neilson's patent. When the attention is once drawn to the hot blast, and various

effects produced beyond what was expected, no doubt a variety of persons, each in his turn, will be seeking to apply it to new materials: but I repeat, if every man who finds out that it is applicable to a particular fuel to which it has not been used, if he is entitled to a patent to give him the exclusive use, I say Mr. Neilson's patent is of very little use.

Now I beg to call your attention to Mr. Neilson's patent and its terms before I come to Mr. Crane's. The patent is stated to be "for the improved application of air to produce heat in fires, forges, and furnaces, where bellows and other blowing apparatus are required." Pray what is the limitation of the use of that patent? Has there been any attempt to impeach the patent? No: Mr. Crane, when he was not interested to dispute the patent, knew better. Whether he advised with Mr. Carpmael then, or who else I do not know, but no doubt he advised with somebody. Mr. Carpmael drew his specification, and that Mr. Carpmael had read Mr. Neilson's specification there can be no doubt. Who then thought of disputing Mr. Neilson's patent? Was it known whether Mr. Neilson continued to apply the apparatus of a given size, precisely the form with which he had begun. No doubt it must have been known that he had varied that form, but was it considered that that was any such variation of principle as destroyed his patent? Not the least in the world, for long after this Mr. Crane, who, if he knew anything about it, must have known the modified form in which the principle had been applied; for you know that a patent is good, not by reason of the precise and particular form which is adopted, but it is the principle of the invention which oftentimes may be applied in a great variety of ways. You know it is the principle of the invention which is protected, and that juries are generally occupied in hearing evidence of attempts to evade it, and forming their judgment whether or not this or that particular mode of effecting the same object is or

is not a colourable imitation and pretended variation, retaining all the substance of the patent; whether that is the case is more generally the subject for the consideration of the jury than the validity of the patent itself. Nobody has dreamt of disputing Mr. Neilson's patent, Mr. Crane least of all, who, whatever benefit he has got, he has got it under Mr. Neilson's sanction, with Mr. Neilson's instruction and assistance. The title of the patent, therefore, is a patent for the improved application of air to produce heat in fires, forges, and furnaces, where bellows or other blowing apparatus are required.

The Lord Chief Justice.—Quite general.

The Solicitor-General.—Yes, my Lord. Now you will observe what is the present attempt, that if any man discovers a forge or furnace to be used with any new description of fuel, or to be applied to any other purpose, Mr. Neilson's patent is not applicable to that, but it may be the subject of a new and exclusive patent right. There is no foundation for it. When he comes to specify, he declares that the nature of his "invention for the improved application of air to produce heat in fires, forges, and furnaces, where bellows or other blowing apparatus are required, and the manner in which the same is to be performed is particularly described and ascertained as follows, that is to say:—A blast or current of air must be produced by bellows or other blowing apparatus in the ordinary way, to which mode of producing the blast or current of air this patent is not intended to extend." Those who choose to retain the old form of bellows or fan are at liberty to do so; Mr. Neilson does not claim that; his patent is not at all applicable to that state of things; he disclaims that his hot blast can be used in connexion with that species of apparatus. Having stated what it is not intended to be applied to, he proceeds to state what it is. He says, "The blast or current of air so produced, is to be passed from the bellows or blowing apparatus into an air vessel or receptacle made sufficiently

strong to endure the blast, and through and from that vessel or receptacle by means of a tube, pipe, or aperture into the fire, forge, or furnace." That is, the air is to be introduced into a vessel or receptacle, and to pass out by means of a tube, pipe, or aperture into the fire, forge, or furnace—it is to be a vessel or receptacle. I have before stated, that specifications on subjects of this sort are supposed to be addressed to men of some practical science, men who have the means of considering and of estimating the effect of the particular concern to which it is to be applied, of adopting the principle in such form as the particular instance may demand. He tells you it is to be a vessel or receptacle, indicating that it is quite immaterial what particular and precise receptacle it should be; it is to be one which shall be modified according to that to which it is to be applied. The word vessel is very general, something which would contain air, and that is all the description he gives of it. Need he give more? Why, he is addressing persons who are connected with furnaces and forges and the application of air; he therefore deals in general terms, well knowing that those general terms are abundantly sufficient to put the mind at work, and to give every facility which can be required to accomplish the object which the patent proposes to attain. He says, "The air vessel or receptacle must be air tight or nearly so, except the aperture for the admission and emission of the air, and at the commencement and during the continuance of the blast it must be kept artificially heated to a considerable temperature." What temperature should that be? Why, that must depend upon the manufacture. One manufacture would require one degree of temperature and another would require a different degree. As his application of the hot blast is intended for furnaces, air furnaces generally, which are applicable to an infinite variety of manufactures, that infinite variety varying in every possible degree in intensity of the temperature also required, so he tells you,

that it must be heated to a considerable temperature; but in that part of the specification he does not give you any precise number of degrees to which it is to be heated: "It is better that the temperature should be kept to a red heat, or nearly so." What is the degree of temperature which will give red heat? Why, you hear it is a degree abundantly sufficient for all the purposes of this particular manufacture, and more. It exceeds the 600, which is said to be an adequate degree of temperature, the temperature at which it is said lead will melt, and which is perfectly adequate to the purpose of this manufacture. He says, it is to be "red heat, or nearly so." What is the evidence you have heard of some of the early forms in which this patent was applied? Why, that it was red or reddish, or a tint of red, or approaching to red heat. He says, that it is better it should be kept to a red heat, or nearly so, that red heat exceeding what is necessary for this particular purpose; and every man in every manufacture must bring to a subject of this description, where you have to apply a general power, a power which has not been created with a view to limitation in its application to a particular manufacture, where a certain degree of heat only is required and no more, but of universal application, each man in his own manufacture must ascertain and know what is the degree of temperature which suits that manufacture. This, as a general standard, he tells you it should be kept to a considerable temperature, and should be kept to "red heat, or nearly so," that red heat, as I before said, considerably exceeding what is necessary for making of iron; and then he goes on to say, "But so high a temperature is not absolutely necessary to produce a beneficial effect. The air vessel or receptacle may be conveniently made of iron, but as the effect does not depend upon the nature of the material, other metals or materials may be used. The size of the air vessel must depend upon the blast and on the heat necessary to be produced. For an ordinary

smith's forge or fire, an air vessel or receptacle capable of containing 1,200 cubic inches will be of proper dimensions; and for a cupola of the usual size for cast-iron founders, an air vessel capable of containing 10,000 cubic inches will be of a proper size. For fires, forges, or furnaces upon a greater scale, such as blast furnaces for smelting iron and large cast-iron founders' cupolas, air vessels of proportionably increased dimensions and numbers are to be employed. The form or shape of the vessel or receptacle is immaterial to the effect, and may be adapted to the local circumstances or situation. The air vessel may generally be conveniently heated by a fire distinct from the fire to be effected by the blast or current of air, and generally it will be found better that the air vessel and the fire by which it is heated should be enclosed in brickwork or masonry, through which the pipes or tubes connected with the air vessel should pass. The manner of applying the heat to the air vessel is, however, immaterial to the effect if it be kept at a proper temperature." What are those directions? They are applicable to an invention which creates the power and gives the means of influencing a vast variety of manufactures, many of those differing in every variety of circumstances. Here are general directions. The air receptacles or vessels are to be increased in number according as local circumstances may require; a very high temperature is essential, red heat is one that may be generally considered approved and useful, but not always necessary. Mr. Neilson obtains this patent in 1828,—what do you hear of it? You hear by the witnesses who are called, that Mr. Neilson or his men are at various places erecting apparatus or inspecting apparatus. The first that is produced you are told is a vessel in this form (pointing to a model); here is a pipe or bottle made of iron. You observe, the fire is placed underneath, the flame plays through the bars, and so encircles the pipe or bottle, but being enclosed in brickwork or masonry. This is a model of

the first form that was assumed. It is extremely probable that the temperature which would be obtained by this means might suit a vast variety of purposes to which forges and furnaces to be heated by the application of this blast might be applied. The first account that you have of it is, that it is used, I think, in some places in Scotland, and that two months after it had been in use, the workman returns and finds the owner of the foundry, for whose purpose this had been erected by Mr. Neilson, recasting himself for the same purpose in the same form. They had had the experience of two months; they knew how far it was applicable to the purpose of smelting iron. At the end of two months they recast the same form a little stronger; that continues at work, the man tells you, for twelve months. The principle of this patent is, that you are to have the atmospheric air confined in a vessel exposed to the action of fire, and that atmospheric air, thus enclosed, thus heated, blown into the furnace. What is there to control the shape of this vessel? You want a greater quantity of heat than a vessel of given dimensions will afford you. What do you do? You may extend its length, or you may have two instead of one, if you please, or you may have ten instead of one or two. Is there any difference in the principle? Not the least in the world. The principle is the exposure of this vessel charged with atmospheric air to the action of the fire, and then having it blasted into the furnace. What does it matter to the principle whether there are one, two, three, eight, or ten? They are all pressed out from the same orifice, there is nothing more in one than the exposure of the vessel to the action of the fire so as to get the atmospheric air to the required temperature, whether it is one, or two, or three, is perfectly immaterial. The higher the temperature you require, the longer you must keep the atmospheric air exposed to the action of the fire. If it passes through a straight pipe, it will only be exposed to the heat a certain portion of time; if it is

not quite long enough you may bend the pipe to give it length. Well, then, inasmuch as the air passing through the vessel, that portion of it which comes in contact with the iron sides will of course be more exposed to the action of the heat than that which is in the interior to the stream. The middle of the volume of air not coming in contact with the sides of the vessel, will not be so heated as the surface which is immediately in contact with the sides of the heated vessel. One object, therefore, will be, if you want a temperature higher, so to conduct the air through, as to bring the largest possible portion in contact with the heated surface of the vessel. Do men of science doubt if they want to give additional heat to the air how it is to be done? Is there any magic in the idea that if you want the heat of the air increased, you will expose that air longer to the action of the heated surface or the fire? None at all; everybody says no, none at all. If, therefore, you wish to retain the air for a longer period of time, instead of having this (pointing to the bottle model), you put it into the pipe, it may be one, two, or three; and you observe, that which is erected by Mr. Neilson, which is the subject of the license which is paid for per ton, the air, as you observe, enters, as it may be here (referring to Mr. Crane's model-pipes), it passes through two or three of these, then it is expelled into the chamber; it re-enters another, passes through three more, and so three and three, or six and six, no matter which, until having been kept a certain portion of time, for no other purpose than to make it travel through and be exposed to these heated surfaces, and to change the exterior surface, which will come in contact with this, it passes out. What is that but in effect just lengthening these pipes, only that instead of lengthening you bend them? Extend this a sufficient length, and you will have the whole effect; so that it is to be a pipe to be shortened, to be only of a given length, and you are not to have sense enough if it is not long enough to add a

little to it. It is nothing more than producing a certain length of pipe—that length would be as easily obtained by lengthening it longitudinally as by dividing it in the manner you have seen; that is the whole object of it. Is there any difference? Not the least in the world; and that is but in effect what it would be if you were to join each of those pipes together and extend them, putting certain stops in particular parts; that is the whole of it. And you understand that all this is enclosed in masonry or brickwork, the same as this is covered with brickwork. Here is the fire (pointing to the models) underneath playing through these bars, and so is the fire underneath this playing through these bars, exposed to its action round these pipes, and the whole enclosed, to prevent the escape of the heat, with masonry or brickwork. Is this Neilson's patent? My best witness is Mr. Crane; he had not got his apparatus until after he had got his patent, yet seeing and knowing the description of apparatus to be used, beyond all doubt seeing and knowing Mr. Neilson's patent, he knows he is right, he is perfectly satisfied that he has no pretence, even with Mr. Carpmael's assistance, of resisting it, and accordingly he gets Mr. Neilson to erect it himself, and come to the agreement with him which you have heard. I therefore say, are Mr. Crane's works conducted upon Mr. Neilson's plan? Here they are constructed by Mr. Neilson, and yet an attempt is made to persuade you that Mr. Crane, who knew nothing upon earth upon the subject, who had no knowledge or intelligence which he could bring to bear on the subject, you are told that Mr. Crane is acting under something quite independent of Mr. Neilson. Gentlemen, it only requires to be looked at and considered a moment, to be perceived, first of all, that the attempt on the part of Mr. Crane is nothing more than this,—a patent which is not professed to be limited to particular and specific purposes, but which is professed

to be applicable to all purposes, which can have no other object than to operate on a different species of fuel with which those furnaces may be fed. Mr. Crane says, "I will take out a patent for applying Mr. Neilson's patent to one particular article of fuel." Is Mr. Neilson's patent limited to one particular description of fuel? If, as I before said, you could get a patent screw, would it be limited to one particular article to which to apply it? Certainly not. The most valuable patents are those which are of general application, which give you the means of bringing other powers and other materials into useful action. No patentee ever yet was thought to be subject to this, that as the knowledge of his patent extended, that as its use and advantage to the public became more obvious, his interests were to be limited; and that every man who found out that the patent could be used for this or that purpose, had a right himself to interrupt the patentee and to take out a patent.

The first question to which I call your attention is to show you Mr. Crane has, in truth, done nothing upon earth but apply Mr. Neilson's patent to known articles by known means to effect a known object. Stone coal had been applied more or less to the manufacture of iron; attention was drawn to it, which so applied, there was no other distinction whatever between the mode of manufacturing the iron with that sort of coal and with any other sort of coal. The object was to manufacture the iron; the means were by various coal, some of one description, and some of another, the stone coal among the rest, so that you will observe, that the thing to be made was a thing perfectly well known before, the materials with which it was to be made were perfectly well known before. Now comes the means by which those materials are to be brought into action, and that is to the hot blast of Mr. Neilson; so that there being notoriously a patent for hot blast, Mr. Crane applied the

well-known hot blast to the well-known materials for making iron, and that is all he does.

Now the question is, whether, in point of law or fact, such a patent can exist. I say it cannot; and my first object has been to present to your consideration the circumstances under which Mr. Crane has set about to establish this claim. And I beg of you to remember, that in a case where so much merit is claimed, and where, with so much merit being claimed, the whole success of the case must depend upon, to a considerable extent, if not altogether, defeating an admitted valuable patent—I say, it is extremely material that in such a case you should bear in mind those parts to which I have called your attention; and that, in point of fact, the persons claiming the merit have been obliged to call in the original patentee in order to carry his own patent into effect. And who is he bringing this action against? The defendants are iron-masters, possessing a valuable property, composed to a considerable extent of this stone coal. Attempts have been made, much beyond what fairness warrants of ascribing, even in this valuable discovery of the hot blast, and of its application so generally to the purposes of fuel in the manufacturing of iron, attempts have been made very much to extend its consequences. It turns out that new establishments have been created in the iron trade, quite independently of the use of stone coal, where bituminous coal is used. It also turns out that anthracite or stone coal has become an article of great and most extensive export. But all the increased value which has lately attached to the property, all the new establishments which are erected, are to be ascribed to the consumption of stone coal in making iron—there is no foundation for that. That for a certain description of iron to be used for certain purposes, the application of stone coal is valuable, there is not a shadow of doubt; my clients are as glad to know it as anybody;

they are manufacturers of iron, and they occasionally manufacture it from stone coal, as you have heard. A person came over from their manufactory from the plaintiff, to see what they were doing; upon which, you will observe, he is invited to the furnace, he is permitted to see everything; and they said, "There, you may go about and inform yourself;" not the least impediment, not the least secrecy; but this action is brought by their neighbour, Mr. Crane, against them, because, forsooth, they, in common with him, seek to benefit by Mr. Neilson's patent of the hot blast, using their own stone, using their own material in the old-fashioned way. "But no," says Mr. Crane, "I have a monopoly of Mr. Neilson's patent as applicable to stone coal, because I made such haste that I got my patent before I knew the least in the world upon the subject, before I had made any experiments, before I had melted an ounce, or knew whether it would or not." Under those circumstances the action is brought.

Now, Gentlemen, first of all it is said that Mr. Crane is the inventor of a new manufacture. What does he mean by "a new manufacture?" Making iron in the same way that it was made before, and merely borrowing the application of another man's patent plan—is that being the inventor of a new manufacture? The description of coal used, no doubt operates on the quality of the iron, for it appears that iron, notwithstanding the roughness of the material, is one of the most delicate manufactures in which you can be engaged; for it appears that the same furnace will vary, nobody can tell why or wherefore; it will to-day produce very good iron; it will to-morrow, from materials which are supposed to be identical almost, the furnace charged in the same way, conducted by the same men, materials from the same heap, will produce iron of a very different description, and nobody can tell why or wherefore. One week the furnace will work well and kindly, and produce good iron, the next week it will

be perverse and unkind, and produce very bad iron, so that according to this, every variety of iron which may be produced in consequence of the use of a different kind of coal is a new manufacture. You hear there are a thousand of these apparently causeless varieties in the quality of the article produced, which no doubt must be something or other in the fuel, the precise nature of which has not yet been disclosed. If you will recollect, in the Abbercrave works, which we are told have failed, there was one very awkward circumstance, which, under the particular state of the times, appear to me very likely to have produced something in the atmosphere to lead to such a consequence; iron was very low; if the Abbercrave works succeeded in making good iron from stone coal and the cold blast, there was a certain sum of 300*l.* a-year to be paid; but iron was so low, and the quantity made or required was so small, that it would not pay to make it. I do not wonder it would not pay, so as to bring the charge of 300*l.* a-year on the proprietors, but it failed. You observe there was a small furnace, which the witnesses have described as an ordinary furnace, though a small one, that did succeed, whereupon they were induced to build a larger one; that larger one did not succeed; somehow or other it did succeed up to the time it was sold, but when it came into the hands of the British Iron Company something or other occurred, and that which had succeeded up to the time of their purchase failed. You would suppose in a large establishment, with a splendid title like that which you have heard,—you would suppose that there were some intelligent persons who when they saw that furnace at work and were about to purchase the works, would have paid some attention to ascertain whether those works were performing their destined office with effect, yet they buy it while it is in work; it is continued in work for some short time, it is then discontinued, and the proprietor gets no 300*l.* a-year, and the price of iron, I am very sorry to say, is not such

now as to give any great encouragement to embark in a speculation which may bring with it the payment of 300*l.* a-year. But you may observe, that the stone coal succeeded in the small furnace there. Now the large one, I think, if I recollect right, is open to some remark; I think that is the one that was worked with wooden cylinders, that is described as having been so bad and so imperfect in its operations, that the surprise would rather have been that it succeeded than that it failed. Mr. Northall's evidence is addressed to that. I am told that he said he did not think it would succeed even with coke. So that you observe that a place purchased expressly with the view of making iron from the cold blast and from stone coal—it succeeds for a time; it fails, having a most imperfect apparatus; when to give effect to any new attempt of this sort it ought to have had every chance given to it by the most perfect apparatus, yet it failed; but you find it succeeded even under the old apparatus with the best materials.

Now, Gentlemen, calling your attention to who is the plaintiff, and what are the circumstances in which he stands, working by a license from Mr. Neilson, getting his patent before he had the apparatus in existence, not showing you he possessed the slightest knowledge on the subject, or that he had made even any inquiry upon it, brings his action against somebody else, because, in common with himself, that somebody also has applied a known invention to known given public purposes. What is the ground of this?

The Lord Chief Justice.—Is it anything but a question of law at last?

The Solicitor-General.—I think not.

The Lord Chief Justice.—I think it is not. I have been listening with great attention to it; it must come at last to what is the meaning of the word "manufacture," under the statute, whether the application of a known mode of working the blast, applying it to all purposes,

when applied to a known purpose is a manufacture? and when you come to the other, whether he is the first and true inventor of it? Then it is again a question of law, whether the applying this knowledge, which is part at least of the invention—and a very important one—applying it to that which is also known, makes him or not the first or true inventor. I do not see anything to leave to the jury.

The Solicitor-General.—I thought your Lordship would have a difficulty. The only part I wish to call your attention to is in regard to the fifth plea.

The Lord Chief Justice.—I thought that was a separate one; but you involve in that the same considerations.

The Solicitor-General.—I have not the least objection to the Court drawing any inference which can properly be drawn.

The Lord Chief Justice.—I think it will be the better course to hear it in the common way, *pro forma* a verdict here, and then, under a special case, on the facts which are on my notes.

The Solicitor-General.—In any way that your Lordship pleases.

The Lord Chief Justice.—Moving on my notes.

The Solicitor-General.—I would move to enter a nonsuit, and if the Court should think fit, turn it into a special case or a special verdict. I have no wish for a special verdict.

The Lord Chief Justice.—There is a great deal of nicety in it.

Sir F. Pollock.—I think my Friend's entering a nonsuit is contrary—

The Solicitor-General.—I will do that which is most suitable to the case.

Sir F. Pollock.—I would rather leave it to the Court to dispose of it altogether.

The Lord Chief Justice.—To say whether it shall be the one or the other?

Sir F. Pollock.—Yes.

The Solicitor-General.—That I have no objection to.

The Lord Chief Justice.—I think we have been beating about it from first to last; it is a mere question which might be raised upon a demurrer.

The Solicitor-General.—I thought your Lordship would intimate to me when you had arrived at that conclusion, otherwise I should have applied to you at the close of the case on the part of the plaintiff; but there is always an inconvenience, I think, until one knows what course the Judge will take.

The Lord Chief Justice.—Then let it be so. A verdict for the plaintiff for one shilling, subject to a motion on your part, either for a nonsuit or special case or verdict.

The Solicitor-General.—Yes, my Lord; the Court is to draw any inference, of course.

The Lord Chief Justice.—O, yes.

Sir F. Pollock.—It is our special jury, my Lord.

The Lord Chief Justice.—It is a proper case, certainly, for a special jury.

Sir F. Pollock.—I don't know whether your Lordship would reserve the power to certify with respect to the merits of the invention.

The Lord Chief Justice.—That is under the Act.

Mr. Sergeant Bompas.—We generally take the rule that the Court shall have the same power as at *Nisi Prius.*

The Lord Chief Justice.—Reserve the same power.

Verdict accordingly,—One Shilling damages.

JUDGMENT.

This case was argued at great length in Hilary term of the present year, before Lord Chief Justice Tindal, Justices Erskine, Coltman, and Maule.

The Court took time to consider their judgment, which was delivered June 13, 1842, by

The Lord Chief Justice.—This was an action on the case for the infringement of a patent, granted to the plaintiff on the 28th of September, 1836, for an improve-

ment in the manufacture of iron. The declaration was in the usual form, and the defendants pleaded thereto, first, that they were not guilty; secondly, that the plaintiff was not the first and true inventor of the said improvement. Upon each of which pleas issue was joined. Thirdly, after setting out at length the plaintiff's specification, the defendants pleaded, that the alleged improvement therein described, was not a new manufacture, invented by the plaintiff, within the intent and meaning of the statute, as to the public use and exercise thereof in England, which allegation was traversed by the plaintiff in his replication. Fourthly, the defendants pleaded, that the nature of the plaintiff's invention, and the manner in which it was to be performed, was not particularly described or ascertained by the plaintiff in his specification; upon which plea issue was joined. And in their last plea the defendants, after referring to the plaintiff's specification before set out in the third plea, stated the grant of letters patent, dated the 11th of September, 1828, to one James Beaumont Neilson, for an improved application of air to produce heat in fires, forges, and furnaces, where bellows and other blowing apparatus were required; that Neilson's invention was the production and application of a hot air blast, and was in public use, with Neilson's license, in the smelting and manufacturing of iron from iron-stone, and was the hot air blast in the plaintiff's specification mentioned; that the plaintiff could not use the hot air blast mentioned in his specification without Neilson's license; and that he had obtained such license before the grant of his letters patent; and that the using by the plaintiff of the hot-air blast in the smelting of iron from iron-stone, combined with anthracite or stone coal, as mentioned in his specification, was a using and imitating of Neilson's invention, whereby the plaintiff's patent was void. The plaintiff replied to this last plea, that Neilson's invention was not the same hot air blast; and that the machinery and apparatus adopted for the application thereof, mentioned and referred to in the plaintiff's speci-

fication, was not, nor was the using by the plaintiff of the invention as described in his specification a using and imitating of Neilson's invention, described in Neilson's specification: which allegation is traversed by the defendants in their rejoinder.

At the trial before me, the verdict was entered for the plaintiff on all the issues, subject to the opinion of the Court upon the evidence given at the trial, as contained in a report agreed upon between the parties, the Court being at liberty to draw the same inference from it as a jury might draw.

On the argument, it was contended by the defendants, that the verdict ought to be entered for them on each of the issues joined on the record; but as the main question between the parties turns on the third issue, which involves the question, whether the invention of the plaintiff is a manufacture within the intent and meaning of the statute of James; that is, whether it is or is not the subject matter of a patent; and as the determination of this issue in favour of the one party or the other, will render the decision of the other issues free from difficulty, the simplest way will be, to apply ourselves in the first instance to that question.

Now, in order to determine whether the improvement described in the patent is or is not a manufacture within the statute, we must in the first place ascertain precisely what is the invention claimed by the plaintiff; and then by the application of some principles admitted and acknowledged in the application of the law relating to patents, and by the authority of decided cases, determine the question in dispute between the parties. The plaintiff describes the object of his invention to be, the application of anthracite or stone coal combined with hot-air blast, in the smelting or manufacture of iron from iron-stone, mine, or ore, and states distinctly and unequivocally, at the end of his specification, that he does not claim the use of a hot air blast separately as of his invention, when uncom-

bined with the application of anthracite or stone coal. Nor does he claim the application of anthracite or stone coal when uncombined with the using of hot air blast; but what he claims as his invention is, the application of anthracite or stone coal and culm, combined with the using of hot air blast, in the smelting and manufacture of iron from iron-stone, mine, or ore. And the question, therefore, becomes this—whether, admitting the using of the hot air blast to have been known before in the manufacture of iron with bituminous coal, and the use of anthracite, or stone coal, to have been known before in the manufacture of iron with cold blast, but that the combination of the two together (the hot blast and the anthracite) were not known to be combined before in the manufacture of iron, whether such combination can be the subject of a patent.

We are of opinion, that if the result produced by such a combination is either a new article, or a better article, or a cheaper article to the public, than that produced before by the old method, that such combination is an invention or manufacture intended by the statute, and may well become the subject of a patent. Such an assumed state of facts falls clearly within the principle exemplified by Chief Justice Abbott, where he is determining what is or what is not the subject of a patent, namely, it may, perhaps, extend to a new process to be carried on by known implements or elements acting upon known substances, and ultimately producing some other known substance, but producing it in a cheaper or more expeditious manner, or a better or more useful kind. And it falls also within the doctrine laid down by Lord Eldon, that there may be a valid patent for a known combination of materials previously in use, for the same purpose, or even for a new method of applying such materials. But the specification must clearly express, that it is in respect of such new combination or application.

There are numerous instances of patents which have been granted, where the invention consisted in no more

than in the use of things already known, and acting with them in a manner already known, and producing effects already known, but producing those effects so as to be more economically or beneficially enjoyed by the public. It will be sufficient to refer to a few instances, some of which patents have failed on other grounds, but none on the ground that the invention itself was not the subject of a patent.

We may first instance Hall's patent, for applying the flame of gas to singe off the superfluous fibres of lace; where a flame of oil had been used before for that same purpose. Derosne's patent, in which the invention consisted in filtering the syrup of sugar through a filter, to act with animal charcoal, and charcoal from bituminous schistus, where charcoal had been used before in the filtering of almost every other liquor except the syrup of sugar. Hill's patent, above referred to, for improvements in the smelting and working of iron; there the invention consisted only in the use and application of the slags or cinders thrown off by the operation of smelting, which had been previously considered useless for the production of good and serviceable metal, by the admixture of mine rubbish. Again, Daniell's patent was taken out for improvements in dressing woollen cloth, where the invention consisted in immersing a roll of cloth, manufactured in the usual manner, into hot water.

The only question, therefore, that ought to be considered on the evidence is, was the iron produced by the combination of the hot blast and the anthracite, a better or a cheaper article than was before produced from the combination of the hot blast and the bituminous coal? and was the combination, described in the specification, new as to the public use thereof in England? And, upon the first point, upon looking at the evidence in the cause, we think there is no doubt, that the result of the combination of the hot blast with the anthracite on the yield of the furnaces was more, the nature, properties, and

quality of the iron better, and the expense of making the iron less, than it was under the former process, by means of the combination of the hot blast with bituminous coal.

It is to be observed, that no evidence was produced on the part of the defendants, to meet that given by the plaintiff on these grounds; and that it was a necessary consequence, from the proof in the cause, that from the substitution of the anthracite coal, in whole or in part, instead of or in the place of bituminous coal, the manufacture of the iron should be obtained at less expense.

It was objected, in the course of the argument, that the quality or degree of invention was so small, that it could not become the subject-matter of a patent: that a person who could procure a license to use the hot air blast under Neilson's patent, had a full right to apply that blast to coal of any nature whatever, whether bituminous or stone coal. But we think, if it were necessary to consider the labour, pains, and expense, incurred by the plaintiff, in bringing his discovery to perfection, that there is evidence in this cause, that the expense was considerable, and the experiments numerous. But in point of law, the labour of thought, or experiments, and the expenditure of money, are not the essential grounds of consideration on which the question, whether the invention is or is not the subject-matter of a patent, ought to depend. For if the invention be new and useful to the public, it is not material whether it be the result of long experiments and profound research, or whether by some sudden and lucky thought, or mere accidental discovery.

The case of monopolies states the law to be, that where a man, by his own charge or industry, or by his own wit or invention, brings a new trade into the realm, or any engine tending to the furtherance of a trade that never was used before, and that was for the good of the realm, that the king may grant him the monopoly of a patent for a reasonable time. If the combination now under consideration be, as we think it is, a manufacture within

the statute of James, there was abundant evidence in the cause, that it had been the great object and desideratum, before the granting of the patent, to smelt iron stone by means of anthracite coal; and that it had never been done before, there was no evidence on the part of the defendant to meet that which the plaintiff brought forward. These considerations, therefore, enable us to direct, that the verdict ought to be entered for the plaintiff on the third issue; that it was a new manufacture—new as to the public use and exercise thereof within England and Wales.

On the same ground, also, the second issue is disposed of in favour of the plaintiff. No evidence was produced on the part of the defendant, to show any inventor earlier than the plaintiff; nor does the fact, that there was an earlier inventor, appear from the cross-examination of the plaintiff's witnesses.

As to the first issue, namely, whether the defendant had infringed the patent, we think it clearly appears on the evidence, that the defendants had used, either in part or in whole, the combination described in the specification of the plaintiff's patent. The plaintiff's evidence goes fully to show certain infringements, and that is not met by any explanation on the part of the defendant. Indeed, the defendant's case did not appear to rest on this point at the trial, so much as on the important question raised by them—whether the improvement described in the specification, was a manufacture within the statute of James.

Upon the fourth issue, which raised no more than the usual inquiry, whether the nature of the invention was sufficiently described in the specification, the usual evidence was given, that persons of competent skill and experience could, by following the directions, produce the manufacture described with success, and the evidence was entirely unopposed; upon this issue also the verdict ought to be entered for the plaintiff.

With respect, however, to the issue raised in the rejoinder in the plaintiff's replication to the fifth plea, we are of opinion, that taking the whole evidence brought forward by the plaintiff, it is impossible to perceive any substantial or real distinction between the hot air blast, and the machinery and apparatus described in Neilson's specification, from that described and referred to in the plaintiff's—or to say, that the using by the plaintiff of the invention described in his specification was any other than a using and imitating of the invention described in Neilson's specification. The plaintiff, indeed, worked by license under Neilson's patent at the time of his discovery. On this fifth issue, therefore, we think the verdict should be entered for the defendants. Then arises the question, whether the plaintiff is, or is not, entitled to the judgment, notwithstanding the verdict on this fifth issue; on which point, the argument on the part of the defendants is, that the taking out a patent for an invention, which invention cannot be used or enjoyed by the public except by means of the former invention of another person, which former invention is itself the subject-matter of a patent still in force, is void by law. Undoubtedly, if the second patent claims, as part of the invention described in it, that which had been the subject-matter of a patent then in force, it would be void, on the double ground that it claimed that which was not new (which indeed would equally be the case if the former patent had expired), and also that it would be an infringement of, and inconsistent with, a former grant of the king still in force, which latter consideration alone would make a new grant void. But in this case there is an express disclaimer of any part of the invention extending to the use of the hot air blast which was covered by Neilson's patent, the specification describing, that the application of the hot air blast was well understood and extensively applied in many places where ordinary fuel is employed. The validity, therefore, of the plaintiff's patent cannot be impeached on either of

the grounds above adverted to. Unless, therefore, the grantee of the new letters patent is bound by law to specify whether such former invention, which is excepted, was so excepted on the ground of its being generally known and used by the public, or on the ground that it was the subject of a patent that secured the use of it to a former patentee, the new patent will be good. But that distinction is as much in the knowledge of the public as the grantee of the patent. If indeed the new patent had been taken out for improvements or alterations in an invention secured by a former patent, there, for obvious reasons, greater particularity would be necessary to distinguish the new from the old. But the present specification expressly says, I take the whole of the invention already well known to the public, and I combine it with something else.

Now it is further argued, that in point of law, no patent can be taken out which includes the subject-matter of a patent still running or in force. No authority was cited to support this proposition, and the case which was before Lord Tenterden, and in which he held, that where an action was brought for an infringement of improvements in a former patent granted to another person, and still in force, that the plaintiff must produce the former patent and specification; that at least affords a strong inference that the second patent was good. The case of Harmar *v.* Playne is a clear authority on the same point; and upon reason and principle there appears to be no objection. The new patent, after the expiration of the old one, will be free from every objection, and whilst the former exists, the new patent can be legally used by the public by procuring a license from Neilson, or by purchasing the apparatus from him or some of his agents; and the probability of the refusal of a license to any one applying for it, is so extremely remote, that it cannot enter into consideration as a ground of legal objection.

On the whole, therefore, we think the verdict is to be

entered for the plaintiff on all the issues except the fifth; that the verdict is to be entered for the defendants on the fifth issue; but that, notwithstanding such verdict, the judgment must be given for the plaintiff.

Judgment for the plaintiff.

Rolls Court, November 4, 1842.

THE LONDON CAOUTCHOUC COMPANY *v.* CARPENTER.

Mr. Hindmarsh moved to restrain the defendant, his agents, servants, and workmen, from making, working, using, or selling the plaintiff's invention, or in any way counterfeiting, imitating, or resembling the same; and from making, manufacturing, or selling the braces, or brace webs, garters, or garter webs, in the Bill mentioned, until the further order of the Court. The patent was originally taken out by a gentleman of the name of Sievier, and subsequently sold to the present plaintiffs, the London Caoutchouc Company. The invention consists in the alternate placing of elastic and non-elastic materials in the warp of a fabric. The infringement had not come to the knowledge of the plaintiffs till very recently. Specimens of the article sold by the defendant were produced, which were alleged to come within the plaintiff's patent, having an elastic and non-elastic warp, and the articles being also covered India-rubber. An affidavit of the original patentee, Mr. Sievier, was read, in which he swears to his belief that the articles sold by the defendant were an infringement of plaintiff's patent.

The service of notice of motion having been proved, and no counsel appearing for the defendant, his Lordship granted the injunction in the terms above stated.

LIABILITY OF A MANAGER OR SERVANT IN A FACTORY TO BE MADE A CO-DEFENDANT IN AN ACTION FOR INFRINGEMENT OF A PATENT.

JONES *v.* BERGER.

Rolls Court, Westminster, Nov. 22, 1842.

A Bill was filed at the sittings after last Trinity term, by Rowland Jones and Joseph Walton, against Samuel Berger and William Berger, for the infringement of a patent for making starch from rice by the aid of caustic alkali and carbonate of soda, defendants being in possession of a patent of a subsequent date for a process of making starch, the subject of the alleged infringement. The Master of the Rolls refused to grant the injunction, but directed an action to be brought against the defendant, Samuel Berger, and an account to be kept in the meantime by him of all starch made upon this particular process; he also admitting for the purposes of the action, having worked according to the third process of his own specification.

Mr. Pemberton now applied for an alteration of the former minutes of decree, confining the action to Samuel Berger, in order to include also the other defendant, William Berger, the Bill having been originally filed against the two, both claiming the benefit of the patent, and being engaged in resisting the plaintiff's right.

Mr. Campbell objected that the defendant, William Berger, was the son of Samuel Berger, and was not a partner in the business, neither was he beneficially interested therein, but merely acted as manager of his father's manufactory.

The Master of the Rolls stated, that according to the allegation of the plaintiffs, the son was actually engaged in infringing their patent. He might not be a partner, or beneficially interested in the business, but still he might be engaged in infringing the patent.

Mr. Pemberton contended that the business was carried on under the names of "Berger and Co.," and Mr. William Berger claimed to be interested in the patent, which was alleged to be the infringement of the plaintiff's patent, and under the third article of which they admitted to be working, whether the son participated in the profits of the business or not.

The Master of the Rolls stated, that the son was helping the father in the business, whether he was interested in it or not.

Mr. Campbell contended that the son ought not to be made a defendant, as he was merely an assistant to his father; and if he was joined in the action, upon the same principle, every workman employed in the manufactory might also be included as defendants.

The Master of the Rolls stated, that no such attempt had been made. If the defendant did not consent to the proposition, it would be for him to consider whether the injunction ought not now to issue.

Mr. Campbell thought there was a degree of hardship upon the defendant, Samuel Berger, in making William Berger a co-defendant, as the effect would be to deprive him of the benefit of his son's evidence in the pending action, he being only a servant in the business.

The Master of the Rolls considered that the defendants could have all the servants in the factory as witnesses, who, perhaps, were the best witnesses they could have.

The minutes were then agreed to be altered, the decree directing the action to be brought against the two defendants, Samuel and William Berger, they admitting the legal title of the plaintiffs in their patent, and also that the defendants have worked according to the third process in their specification.

PATENTS GRANTED FOR SCOTLAND,

From October 26 to November 3, 1842.

JOHN VARLEY, of Colne, in the county of Lancaster, Engineer, and EDMONDSON VARLEY, of the same place, Cotton Manufacturer, for certain improvements in steam-engines.—Sealed October 26, 1842.

JAMES HYDE, of Duckenfield, Cheshire, Mechanic, and JOHN HYDE, of the same place, Cotton Spinner and Manufacturer, for a certain improvement or improvements in the machinery used for preparing cotton, wool, silk, flax, and similar fibrous materials for spinning.—Sealed November 3, 1842.

LIST OF NEW PATENTS.

MATTHEW GREGSON, of Toxteth-park, Liverpool, Esq., for improvements applicable to the sawing or cutting of veneers.—Sealed November 2, 1842.—(*Six months.*)—Communicated by a foreigner residing abroad.

JOSEPH EDWARDS, of Bloomsbury-square, Clerk, for an improved razor-strop or instrument for sharpening certain cutting edges, and an improved material for covering the same, which material is also applicable to other purposes.—Sealed November 2, 1842.—(*Six months.*)

Sir JOHN SCOTT LILLIE, of Chelsea, for certain improvements in roads.—Sealed November 2, 1842.—(*Six months.*)

PIERRE PELLETAN, of Bedford-square, Esq., for improvements in the production of light.—Sealed November 2, 1842.—(*Six months.*)

JAMES BULLOUGH, of Blackburn, Overlooker, for certain improvements in the construction of looms for weaving, and is in possession of certain improvements in the same, which have been communicated to him by a foreigner residing abroad.—Sealed November 3, 1842.—(*Six months.*)

RICHARD BEVAN, of Liverpool, Wine Merchant, for certain arrangements connected with the circulation of steam employed in pipes or tubes for producing heat, and the application of such arrangements to various purposes.—Sealed November 3, 1842.—(*Six months.*)

JOHN ROTHWELL, of Great Bolton, Lancaster, Grocer, for a certain composition and preparation to promote the ignition and combustion of coke, coal, and other com-

bustible substances, in stoves, furnaces, and grates.—Sealed November 5, 1842.—(*Six months.*)

William Coley Jones, of Vauxhall-walk, Lambeth, Practical Chemist, for improvements in treating or operating upon a certain unctuous substance, in order to obtain products therefrom for the manufacture of candles, and other purposes.—Sealed November 8, 1842.—(*Six months.*)

Pierre Frederick Ingold, of Buckingham-place, Hanover-square, Watchmaker, for improvements in machinery for making parts of watches and other timekeepers.—Sealed November 8, 1842.—(*Six months.*)

Arthur Harvie, of Wilmington-square, Gentleman, for improvements in the process of vinous fermentation.—Sealed November 8, 1842.—(*Six months.*)

Thomas Wrigley, of Bridge Hall Mills, Bury, Lancashire, Paper Manufacturer, for certain improvements in machinery for manufacturing paper.—Sealed November 8, 1842.—(*Six months.*)

John Mitchell, of Birmingham, Steel Pen Manufacturer, for a certain improvement in the manufacture of metallic pens, and a certain improvement in the manufacture of pen-holders.—Sealed November 8, 1842.—(*Six months.*)

John Spinks the younger, of John-street, Bedford-row, Gentleman, for an improved apparatus for giving elasticity to certain parts of railway and other carriages requiring the same.—Sealed November 8, 1842.—(*Six months.*)

Henrih Lander, of North-street, Sloane-street, Engineer, for certain improvements in steam-engines, boilers, and furnaces, and in the methods of feeding and working the same, as also in the machinery for applying steam power to propelling purposes.—Sealed November 8, 1842.—(*Six months.*)

John Barnes, of Church, Lancaster, Manufacturing Chemist, and John Mercer, of Oakenshaw, Lancashire, Calico Printer, for certain improvements in the manufacture of articles used in printing and dying cotton, silk, woollen, and other fabrics.—Sealed November 10, 1842.—(*Six months.*)

Robert Brown, of Surbiton-hill, near Kingston, Tile, Pot, and Brick Manufacturer, for improvements in the manufacture of garden-pots.—Sealed November 15, 1842.—(*Six months,*)

Charles Rowley, and James Turner, of Birmingham, Button Manufacturers, for improvements in the manufacture of perforated metal buttons. — Sealed November 15, 1842.—(*Six months.*)

Andre Eustache Gratien Auguste Maurras, of Cornhill, Gentleman, for certain improvements in the process and apparatus for filtering water and other liquids.—Sealed November 15, 1842.—(*Six months.*)—Communicated by a foreigner residing abroad.

Charles Smith, of Newcastle-street, Strand, for improvements in the manufacture and application of bricks, tiles, and other plastic articles or surfaces, and for cements or compositions to be used with, in, and about the same, for building and other useful purposes.—Sealed November 17, 1842.—(*Six months.*)

Felix Napoleon Target, of Blackheath, in the county of Kent, Gentleman, Leon Castelain, of Back-lane, Shadwell, Chemist, and Adolphe Aubrie, of Back-lane, aforesaid, Artist, for a new method of refining or manufacturing sugar.—Sealed November 25, 1842.—(*Six months.*)

James Smith, of Coventry, Pattern Drawer, Reader, and Cord Stamper, for improvements in weaving ribbons and other ornamented fabrics.—Sealed November 25, 1842.—(*Six months.*)

Charles Heard Wild, of Birmingham, Engineer, for an improved mode of constructing floors for fire-proof buildings.—Sealed November 25, 1842.—(*Six months.*)

Frederick Oldfield Ward, of St. Martin's-lane, Gentleman, and Mark Freeman, of Sutton, Surrey, Gentleman, for improvements in candlesticks, apparatus, and instruments employed in the use of candles and rushlights.—Sealed November 25, 1842.—(*Six months.*)

Pandia Theodore Ralli, of Finsbury-circus, Merchant, for improvements in the construction of railway and other carriages, and in apparatus connected therewith.—Sealed November 25, 1842.—(*Six months.*)—Communicated by a foreigner residing abroad.

Isham Baggs, of Wharton-street, Middlesex, Chemist, for improvements in producing light.—Sealed November 25, 1842.—(*Six Months.*)

William Henry Fox Talbot, of Locock Abbey, Wilts, Esquire, for improvements in coating or covering metals with other metals.—Sealed November 25, 1842.—(*Six months.*)

INDEX

TO

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